The Forward March of Natural Gas
Keynote Address

by
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Abstract

Strong energy growth is anticipated over the next 20 years, particularly in natural gas and renewables, which will grow between 3 and 4 percent per year, twice the rate as oil and coal, with flat-to-negative growth in nuclear energy. Of about 206 quads total growth (roughly 100 million barrels of oil equivalent/day), about 70 will come from natural gas (the largest increment added to the mixture), about 68 from oil (barely remaining the largest energy source), 41 from coal, and about 28 from renewable (basically doubling). So, we see strong growth in clean fuels; less-than-average growth in coal and oil; and flat-to-negative growth in nuclear. The Asia-Pacific area will experience the greatest natural gas demand growth at about 14 quads; North America, today's biggest market, will be have the second-greatest growth, totaling 16 quads. Other fast-growing areas are Latin America, the Middle East, and the Pacific Rim.

Probably over half the growth will go toward power generation. The developing world will need to add about $100 billion each year in power plants, liquids plants, and pipelines; companies are positioning themselves for this great global opportunity. Almost 50 percent growth is foreseen in total U.S. consumption, primarily for electricity generation. Technology will keep gas prices flat. Worldwide economic growth is forecast to grow 3.3 percent per year, due to the move to market-driven economics and population increase. Those who want to lock in long-term supplies at long-term prices can do so for up to 20 years. Technological improvements have helped stabilize gas prices. There is a gas supply of about 200 years, at current consumption rates. The real key to future gas prices comes down to the kind and rate of economic growth and consumption.

Currently, about half the states have initiatives to provide consumer choice for natural gas. With electricity, ten states have passed legislation or enacted policies for deregulation and consumer choice. Eventually, retail electricity and natural gas will become about a $200 billion market. Small customers (commercial and residential) may ultimately benefit more than industrial customers, who already have established favorable contracts. Resulting mergers may cause the largest single restructuring of any industry in this century, and it probably will have the greatest potential benefit to the U.S. economy. Enron recently became the largest wholesale marketer of electricity in the country.

The carbon dioxide concentration in the atmosphere has increased steadily since the beginning of the Industrial Revolution, and continues to rise. Evidence indicates that this is raising temperatures worldwide, and global warming has become the number-one environmental

issue. It is a wildcard in everybody's energy forecasts, and one reason why Enron has a very strong commitment to renewable energy. Enron is growing in the hydro business, has one of the two largest solar energy companies in the world, and recently announced the largest wind project in the world. Wind probably is competitive with coal, and certainly with nuclear. Solar is still out of competitive range, but getting close. Deregulation of retail electricity probably will accelerate the move toward renewable energy.

Introduction by Hugh D. Guthrie

(FETC Senior Management and Technical Advisor)

You know it's always a chore to introduce men of distinction. Men of distinction are men of distinction because of their accomplishments. All of you have the biography of Ken Lay in your handout. That tells you that we have a man of distinction who has agreed to address us today. As I thought about what I could say about him that is not already in that biosketch, I was reminded of an occasion, probably 30 years ago, when I had the responsibility of introducing the "only living" charter member of the American Institute of Chemical Engineers at that time, Dr. Frederic Dannerth. And I was nervous! So I turned to Dr. Dannerth and I said, "Dr. Dannerth, if you had just one sentence of advice that you wanted to give to a young professional, what would you say?" There was a long pause, and I mean a *long* pause. I was sure I had asked the wrong question. And then he said very quietly, "I would remind him that you never fill a job, you create one."

I think that describes Dr. Kenneth Lay in what he has done as Chairman of Enron. He didn't fill that job, he created one. In speaking to Ken just a few minutes ago, I was impressed with his philosophy to build an organization around the people you have, not to seek people to fill an organization. This indicates that a part of his creativity is not only in making decisions that lead this industry in interpreting the best way to operate a company over the ensuing decade. He also has that creativity to look at the people in his organization and to make sure that the organization takes advantage of their many qualities.

Ken, it really is a privilege to have you address us today. I want to express my sincere thanks on behalf of us all for your being here.

Address by Ken Lay

Thank you, Hugh. That was a very kind and warm introduction and I do appreciate it. You and I go back a number of years and I'm one of your great admirers, as are many in this audience.

I'm delighted to be here today to share a few thoughts with you. I also know my main purpose here today, Hugh, and that is to be the warmup act for Railroad Commissioner Charles Matthews! If I can get you warmed up enough, then he is going to get up here and really tell you the whole truth about the energy business, particularly here in Texas.

First, I want to review our current thinking on the energy outlook for the U.S. and the

world, particularly for natural gas. Then I want to discuss two of our favorite subjects today: (1) the revolution in customer choice and competition in the retail electricity and natural gas business, and (2) the convergence of those two very large industries. Here I think we are creating new markets and opportunities. I also will discuss briefly a third topic: why we are optimistic on renewable energy.

Let me say at the outset that what I am sharing with you is very much a work in progress. We had hoped to have this finalized by now, so I could see the final document or the final numbers. But it is not finalized, which perhaps reflects what is going on in the world today. I think I have some numbers that will interest you, and then I want to share my thoughts on why these numbers may—or may not—represent the real outlook that we will release soon. There may be differences in order of magnitude, but the direction will stay the same.

The Energy Outlook

Let's move right into the world energy outlook. First of all, we anticipate pretty strong energy growth over the next 20 years, particularly in natural gas and renewables. Over the next 20 years, we think natural gas and renewables will grow between 3 and 4 percent per year, or twice the rate of oil and coal, which have carried most of the energy load for the industrialized world in recent decades. You can see virtually flat growth in nuclear energy. Nuclear's growth may even be negative during this period as nuclear plants are prematurely abandoned, even though some growth will occur in the developing world, particularly in Asia.

In this outlook, we see a total need over the next 20 years of about 206 quads, or roughly 100 million barrels of oil equivalent per day of new energy supplies to meet the need of our growing economy and growing population worldwide. We think about 70 quads will come from natural gas, and that will be the largest single increment of energy supply added to the total mixture in this 20-year period. We think about 68 quads will come from oil, with oil remaining the largest energy source, but barely. We see about 41 quads from coal, and about 28 quads in renewable energy. We see renewable energy becoming very significant during this period, basically doubling the renewable energy we have today. So, we see strong growth in clean fuels; less-than-average growth in coal and oil; and flat-to-negative growth in nuclear.

As we look at where the natural gas growth will occur, we have the highest growth rates starting in Latin America, at 7 percent per year. The second-highest growth rate is in the Middle East; the third, in the Asian Pacific Rim. In all of these places, you would probably expect natural gas to grow at extra-high rates. We have the slowest growth in Russia, the former Soviet Union, Eastern Europe, North America, and Western Europe. That somewhat camouflages what is going on. Look again at the largest single markets in total terms—total quads, or Tcfs. Asia-Pacific will be second-biggest, at about 14 quads of growth during this 20-year period. North America will be the biggest, another 16 quads, and the most mature market. Of course, the slowest growth is in Africa, with about 3 quads. Indeed, there is natural gas market growth in all areas of the world, particularly the strong growth in the two big areas of Latin America and the Asia Pacific Rim.

Where is this growth coming from? Again, we are very bullish on natural gas for power generation. I will show why a little bit later. Probably about half the growth in natural gas during the next 20 years will go toward power generation. This is particularly so because emerging nations—the developing world—have a tremendous appetite for new power plants, particularly with the environmental and economic advantages of natural gas combined-cycle power generation. Obviously, if you throw in both power plant generation and industrial use, you get about 80 percent of all the growth we are seeing worldwide. Not that we see a lack of significant growth in commercial and residential markets—our people envision adding up to 50 million new natural gas customers during these two decades. But compared to growth from industrial development, power plant generation, and these industrial markets, commercial and residential pale by significance.

Looking at such forecasts over the past several years, Enron is moving increasingly toward the global market, where we see a great opportunity. Clearly, we have become a much more international or global company. As recently as 1990, Enron received only about 4 percent of its operating income from the international marketplace, and virtually all of that came from Venezuela, in the Caribbean. By last year [1996], about 25 percent of our operating income came from the international market, and that occurred within a threefold increase in operating income from 1990 through 1996. We expect to roughly double our operating income again by the year 2000, and we expect about 40 percent of it to be from the international marketplace. We now have completed construction on our operating power plants, pipelines, gas liquids plants, and E&P activities in about 15 countries. We have projects in advanced stages of construction and development in about another 20 countries. Again, we are responding to what we think are enormous opportunities in this developing world.

If we look at our backlog right now, we have over $20 billion in new projects that are in very advanced stages. About $3 billion of those were financed late last year and are now under construction. Our Indian project has received a lot of notoriety, but now it is back and under construction, bigger and better than when it was canceled. We have a big project in Italy, and a large one in Turkey. We expect to add at least three more, and to have them financed and into construction this year—over $1 billion in projects for Puerto Rico, Guam, and Indonesia. Again, this is being propelled by virtually all estimates, starting with the World Bank's, that over the next 15 or 20 years at least, the developing world will need to add, each year, about $100 billion in power plants, liquids plants, and pipelines. We are positioning to participate in that, like everyone else.

The U.S. Natural Gas Market

We turn to the U.S. marketplace—again, one of strong growth, almost 50 percent in total consumption. Natural gas consumption over the next 20 years will grow from about 22 quads to about 33 quads. Again, the primary growth vehicle will be power plant generation, probably initially by reloading some of our existing natural gas power plant fleet as we move to economic dispatch of power plants versus the current regulatory dispatch of power plants. There is a world of difference when you are dispatching based upon true marginal economics, versus dispatching based upon how long you can keep a large investment and rate base and earn on them. I think we will see more utilization of our gas pipeline and our gas power plant fleet as we start growing in

the market and possibly replacing some existing plants, including nuclear plants. We will see more than our share of new natural gas power generation.

Again, in the U.S., power generation and industrial use will be about 80 percent of the growth, with some pretty good growth in residential and commercial. But with today's efficient gas appliances, this will not be a big share of the total demand profile.

We have experienced good growth in natural gas consumption and production over the past six or seven years. Even over the past ten to eleven years, we have had good, strong growth. About half of that growth and demand has been satisfied with increases in production, with lower-48 production increasing about 800 million cubic feet per day, or a little less than a billion cubic feet per day. Canada has provided approximately the other half. For the next two years, we are pipeline-constrained from Canada. So, even if we are able to sustain the same level of growth in lower-48 production, we will not be getting the same level of incremental supply from Canada. This is leading many to think that we will keep a fairly tight supply-and-demand balance and fairly firm gas prices for at least the next couple of years, despite where the prices are today and despite the warm winter. Beyond that, I think it is unrealistic to expect Canadian natural gas exports to continue at the rate we have seen over the last few years. I expect that, for all kinds of reasons, the Canadians will be unable to build the infrastructure—but more importantly, they will want to keep more of their incremental supply at home, because they are growing their own markets. Again, we foresee good growth in lower-48 production, stronger growth and demand, and a good, strong growing market going forward.

Natural Gas Prices

There has been a lot of discussion—particularly during this past winter, although it happens every winter—about the overall outlook for natural gas prices. We are not bulls on this. I am going to paint a scenario that may give you a little different viewpoint. We are assuming that, over the next 20 years, oil prices will remain at about $18 real and natural gas prices will stay pretty flat, both in North America and worldwide. The thinking behind this is technology—what you all are meeting on at this conference. We have seen dramatic technological improvements in finding, developing, and producing natural gas and oil, particularly natural gas, over the past few years. There is no reason to think that this will not continue. Indeed, the whole world is going through a fairly significant deflationary trend on natural resources. It is hard to find very many natural resources that are at higher real prices today than they were a decade ago, or 15 years ago. Many are forecasting that this will remain true going forward. With global competition and pressure from all of the market forces, we well may see flat or maybe somewhat lower real prices over this 20-year period.

There is another scenario, for which we will develop some other analysis over the next few weeks. Certainly, by the time we publish the *1997 Enron Outlook*, we will have some alternatives. Starting 15 years ago, and even until recently, we have had some very large surplus deliverability of oil worldwide. Also during that 15-year period, we have had a very large surplus deliverability of North American natural gas. However, both of these surpluses have disappeared today. We have a fairly balanced oil supply-and-demand worldwide, and a fairly balanced North

American natural gas supply-and-demand. At the same time, we are seeing accelerating worldwide GDP growth.

In the former Soviet Union, a socialist-communist model has been fully tested. It has failed, and now everyone has repudiated it. Now, whether they call it capitalism or not, countries worldwide are going to a market system of sorting out their economic activities—economic liberalization, economic competition, more liberal trade, more liberal foreign investment—and the result is much faster economic growth. Over the last four years, worldwide GDP has grown about 3½ percent-plus per year. At the same time, Japan, Western Europe, and virtually all of the former Soviet Union have been flat in GDP growth, or even declining in the case of the former Soviet Union, particularly Russia. I think it unrealistic to believe that all three of these big economic blocks will continue to have a flat-to-declining GDP growth going forward. We will continue to have recessionary periods, but there is a good body of thought today that we are going to see higher GDP growth going forward than we have seen for quite a period. Our assumption in this base forecast is about 3.3 percent growth per year. I think you can easily build consumption to a 3½ percent annual GDP growth rate. Some might even be a little more aggressive than that, looking at what is happening in Asia and Latin America today.

In any event, we are looking at another ½ percent-per-year growth in worldwide GDP just with population increase, particularly for countries like China, India, and Indonesia. They are growing at very strong rates for the first time—or at least in the case of India, the first time in several decades—whereas China and Indonesia are continuing recent population trends. We could see a much stronger energy demand, and a much stronger upward pressure on prices, than is inherent in this forecast. I just plant this as a seed, because before we come out with our report, we will be doing some additional analysis looking at some alternatives, which could be interesting. Of course, the main result will be to put further pressure on technological advances to mitigate price increases and to meet the much larger energy demand for all energy sources, particularly oil and natural gas and renewables.

One other point on this price scenario. We had a lot of discussion, particularly this winter, on the volatility of gas prices. Gas is one of the most highly volatile commodities in the world. As you can see, back in December [1996], we saw prices as high as $4.50 per MMBTU, whereas they were as low as about $1.75 last fall. The $4.50 was almost a doubling within just two or three weeks. Then you see the long-term forecast, or the long-term fixed-price contracts, or the long-term prices that were being offered in the marketplace throughout this period. You could have ten-year gas in December at about $2.64, and on January 30th that price dropped to $2.60. On January 30th, you could still buy ten-year gas at about $2.56. I point this out because we often say, “Well, the price is so volatile that we cannot depend on natural gas.” People who want to lock in long-term supplies at long-term prices to assure economics in natural gas power generation, or any other use, can do so, and they can do it for up to 20 years today. Indeed, we will continue to see a lot of fluctuation in short-term spot prices. We will see some changing trends over time, and certainly 10, 20, or 30 cents from time to time on 5-to-10-year contracts. But it is not that difficult to lock in the economics of a project and to become immunized from short-term fluctuations in spot prices.

The Role of Technology

Here is an interesting slide about technology, and you all know the facts here. Gas prices have fluctuated quite a bit, even annually, over the past 6 years or so—as low as $1.55 back in 1995, or as high as $2.15 on the average last year [1996], with prices in between. But through that period, our finding cost has steadily declined from about 84 cents back in 1992 down to about 68 cents in 1995. A particularly dramatic drop has been in offshore finding cost, about a 44-percent drop, largely a result of technology. Starting in 1992, most of the surplus capacity and big price drops of the 1980s were behind us. This was just a matter of improved seismic, improved drilling, and improved fracturing technology. There have been all kinds of technological advances. In 1996 and in 1997 we are seeing more pressure on all of these costs. They well may flatten out, or even go up somewhat, for a while. But an awful lot of this technology is being driven by the speed of computing, and I don't think that is going to slow down. This is providing additional opportunities, particularly seismic. I think we will continue to see technological forces mitigating against upward pressures on prices.

Reserves and resources continue to be more than abundant. You can see, even over this ten-year period, significant increases in our proved reserves, particularly in Russia or the former Soviet Union and the Middle East. Most of the drop in North America was in Mexico, where its reserve numbers probably were calibrated more carefully, which might be the best way of putting it. North American reserves, except for Mexico, have been virtually flat, despite much-increased consumption and little increase in drilling activity. Over the past 20 years or so, we have seen worldwide proved reserves essentially double, at the same time that our natural gas production has more than doubled. The more we are consuming, the more we are finding, and the more we are adding to our proved inventory. If we add in our economically recoverable resources, we find a number about three times the size of this 5,000 Tcf. So we are looking at a very significant future supply of about 200 years, at current consumption rates. Thus, there is no reason to be pessimistic about the resource base. There is no reason to be pessimistic about technology. The real key to the future of gas prices comes down to the kind of economic growth we have and the rate of growth we have in overall consumption.

Another reason we are so bullish on natural gas is the combined-cycle power plants and the use of natural gas for power generation. In these slides, we are comparing high and low gas cost, high and low coal cost, capital cost, and so on, plus what we think is a reasonable expectation for nuclear energy. In the case of coal, we are holding at about 65 percent utilization rates, which is about the best that coal plants can do, whereas natural gas plants typically are operating at well over 90 percent utilization, in many cases over 95 percent. Even when we build in these really conservative assumptions, the natural gas price advantage per kilowatt hour over the life of the plant is at least a penny, which is about 20 percent less than for a new coal plant, whether that be high or low cost. Today, we can build natural gas plants that bring the cost down another 1 or 2 pennies, compared to what you see here, particularly by utilizing these plants at a much higher load factor. This is true worldwide. The technology in power generation just continues to advance. The next generation of power plants now being built has about a 60-percent conversion efficiency (gas Btus to electric Btus). That is up from about a 45-percent conversion efficiency as recently as the mid-1980s. There is no reason to think that we will not

continue to improve here, too—becoming very, very, efficient, again providing additional economic and environmental advantages for natural gas.

The Impact of Deregulating Natural Gas and Electricity

Let me talk about another subject that is near and dear to our hearts today, and which is impacting our industry dramatically—maybe more dramatically than anything else in this century: deregulation of both natural gas and electricity at the consumer or retail level, and the convergence of these two industries. Several states—probably 14 or 15—already allow some form of competition in retail natural gas markets, and some are big states like California, Illinois, Ohio, New Jersey, New York, Maryland, Connecticut, Indiana, Pennsylvania, and Massachusetts. So, a number of states already have pilot projects, or have at least a semblance of unbundled transportation services through the distribution meter, or otherwise are providing consumer choice and retail competition for natural gas.

On electricity, we already have ten states that have passed legislation, or their regulatory bodies have enacted policies that provide for electricity deregulation and consumer choice at the retail level. Seven of these ten states will allow competition next year [1998], some for all of the customers in their state. These seven are California, Pennsylvania, New Hampshire, Rhode Island, probably New York (a little uncertainty there), probably New Jersey by late in 1998, and Massachusetts on January 1, 1998. In fact, most of these will happen on January 1, 1998. Some big states like California and Massachusetts increasingly look like they are going to open up competition for all classes of customers at once.

This year, the competitive portion of the retail natural gas and electricity markets is about a $3-billion market. We think by next year it will be about a $40-billion market. And within five years, it will be about a $150-billion market. Eventually, retail electricity and natural gas will become about a $200-billion market overall.

All kinds of groups have looked at the savings from competition and customer choice, from the Brookings Institute to Citizens for a Sound Economy and many others, including many academic institutions. Historically, this country has transformed several monopoly franchise businesses from a regulated status to a competitive, consumer-choice status. These include natural gas, telecommunications (particularly long-distance telephone service), and other industries such as airlines, trucking, and railroads. When competition is created, we usually see a 15-to-20 percent savings for consumers fairly soon, usually within two or three years. We see a 30-40 percent savings within five to ten years, in real terms—in real dollars, not in inflation adjustment. So, as we look at this market, we are talking about potential savings of at least $60 to $80 billion per year. This will have an enormous and favorable impact on the U.S. economy and consumers.

Despite what some have said, particularly those trying to slow this process, we think that small customers—the commercial and residential customers—may ultimately benefit from this deregulation more than even industrial customers, because industrial customers already have pretty much gotten their deals. As we say down here in Texas, “the big dogs have already eaten.”

Indeed, they have had the alternatives of co-generation, or behind-the-fence generation, or just the economic clout to beat down rates at both their utilities and regulatory commissions.

In any event, the train is moving and is moving very fast. These three slides assume that we will have no Federal legislation. But I think the odds are better than 50-50 that we will have Federal legislation, and if anything, it probably will accelerate the trend. All but four states are actively moving toward electricity deregulation. Probably within five years, three-quarters of the whole market will be completely deregulated and open to competition. As it now stands, the electricity business will become one of the most fragmented in the world. That market has somewhere between 200 and 250 privately owned, investor-owned utilities. This includes about 3,000 munies [municipal power plants] and real electrics and other types of co-ops or government-owned utilities. Many of those are regional, within one state or part of a state. We would expect to see quite a bit of consolidation coming out of this.

A lot of the mergers announced so far—about nine pending right now—are between regional or neighboring utilities. We have announced our intention to merge with Portland General Company in the Pacific Northwest. Pan Energy and Duke have announced a merger; they are two quite different animals. In any event, we will see a lot of restructuring. This may be the largest single restructuring of any industry in this century. It probably also will have the greatest potential benefit to the U.S. economy.

Let us look at what is happening in the natural gas marketplace today, at wholesale only, not retail, because retail is not widely available yet. Over the past few years there has been some consolidation of wholesale merchants. Some combinations have formed along the way, but today the top-ten merchants—and they all are big—are all aggressive. There is a lot of competition out there, with deals flowing one way or the other, based on some very small price differentials. The top ten have about 90 percent of the market. Enron, we believe, is still the largest with about 16 percent. As I say, there has been significant change since 1990, as you can see on the left-hand chart.

Electricity is starting off a little differently. It is a much more complex business. It takes a lot bigger balance sheet to perform the contracts. Reliability is even a bigger issue. Here, we are starting off again with the top eight marketers having about 80 percent of the market, with, again, Enron having the largest share. We flowed our first physical electricity in June of 1994, a little less than three years ago. Early in 1997, we believe we became the largest wholesale marketer of electricity in the country, with about 33 to 35 million kilowatt hours. We are bigger than the Tennessee Valley Authority, which, for at least in my lifetime and most of yours, has been the largest wholesale marketer of electricity in the U.S.

The Greenhouse Effect, Natural Gas, and Renewable Energy

Let me wrap up with a couple of slides to indicate why we think our forecast on renewables and natural gas—as bullish as it might appear—in the end may be somewhat conservative. This is the Greenhouse Effect—what we know and what we don't. We do know, in fact, that concentrations of carbon dioxide in the atmosphere have gone up significantly since the start of the Industrial Revolution about 200 years ago. Today, the CO_2 content in our

atmosphere is about one-third higher than it was 200 years ago, a level that had existed for several thousand years, as far back as we know. The level will continue to go up. At the Earth Summit in Rio Centro in 1992, I remember the industrialized countries saying they would not only flatten out this increase but take it back to the 1990 level. I will show you in a minute how we are doing on that. But even if we did flatten out the increase, the concentration still would continue to go up. This is a known fact. And it may not be a known fact, but scientific evidence certainly indicates that CO_2 concentrations are doing something to the atmosphere and to temperatures worldwide.

This Intergovernmental Panel on Climate Change [IPCC] was set up by the United Nations. Initially, there was great disagreement in that group as to whether global warming was happening. In the most recent meetings, not too many months ago, they concluded that global warming has occurred over the past century, particularly over the past several years. They also concluded that "it is unlikely to be entirely due to natural sources," and secondly, "a pattern of climatic responses to human activities is identifiable in the climatic record." You can disagree with that, and many people do. But that is where at least that group of scientists came out.

The third thing, probably difficult to disagree with, is that global warming has become the number-one issue of the environmental community worldwide. And once they decide on an issue, it may take some time, but something usually happens. If we look even at our own forecast, which as I said is reasonably optimistic for natural gas and renewable energy, you can see what happens to CO_2 emissions over this 20-year period. Of course, they are higher today than they were in 1990, which should give you some idea as to what kind of progress we are making in getting back to 1990 levels! During this period, we expect overall CO_2 levels to go up about 50 percent from where they are today—from about 6.3 billion metric tons per year to about 9.5 billion metric tons per year. You can see wide variation in some places like India, which may go up 80 percent, and China, up about 56 percent, and all of the non-OECD countries up about 60 percent (OECD is the Organization for Economic Cooperation and Development). If you look at what's going on in the industrialized world, we see North America up 28 percent, and other OECD countries up about 12 percent. These are significant increases, but compared to a 50 percent increase in overall CO_2 emissions, this still would be 38 percent, even if we held worldwide coal consumption flat. This is the order of magnitude of the challenge we may face, if we chose to pursue this problem. This is a serious problem, and one we are trying to do something about. It is a wildcard in just about everybody's energy forecast today. It is certainly one we all need to keep our eyes on. It is just one reason why we have made a very strong commitment to renewable energy. We are staking out a significant position in this industry, particularly in the wind, solar, and hydro parts of it, which we believe will grow very fast for all kinds of reasons during this next 15 to 20 years.

Through our Amoco Enron solar joint venture, we are one of the two largest solar energy companies in the world. We recently bought Zond Corporation, which is one of the largest wind companies in the world. We think they have some of the best technology, if not the best. We recently announced the largest wind project in the world, an approximately 112-megawatt project in Iowa. Prior to that, we had what is now the second-largest wind project, in the northern Great Plains. We also are getting very large in the hydro business, because we think this is a business that will grow during this period.

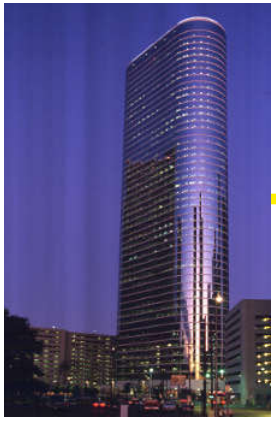
It is not just global warming or environmental pressures; here is the main reason we think it is going to grow. Over the past 15 years or so, we have seen the cost of wind and solar energy come down between 70 and 75 percent—again due to technology, which is what your conference is all about. But also, commercial-application scale is bringing the cost down through higher-volume production. Today, wind is very close to being competitive on a nonsubsidized basis. It probably is competitive with coal, and certainly is more than competitive with nuclear. Solar is still a little bit out of the competitive range, but it is getting very close. Let me say that we also think that deregulation of electricity in the retail market and consumer choice probably will accelerate the move toward renewable energy through "green pricing" programs.

In surveys, we find that many consumers would be willing to pay some premium to take some share of their electricity from renewable sources. It could be that consumer choice will be the single biggest force behind the growth in renewable energy. These surveys indicate that a large slice of the population, if offered the choice, would take 10 or 20 percent of their total electricity from renewable sources to "do their part in saving the planet." We will see. But consumer choice also will have an interesting impact on this business.

Enron, an Innovative Leader

I must show at least one bragging slide. Each spring, *Fortune* magazine lists America's most admired companies. We are lucky to have been included in the past few years as most admired in our industry, which we appreciate. What is interesting is that, for the past two years, we have been ranked number-one in innovativeness, which is one of eight characteristics on which they poll several thousand people. As you can see, were are in there with a good gambling company, Mirage Resorts, and a fairly good high-tech company, Intel. Intel has been in the number-three slot for two years running also. Last year, Rubbermaid was number two. But it does indicate that we are recognized as a company that is doing some things a little differently from some others. We might, in fact, be creating some things, as you indicated at the outset.

Let me conclude with this slide. The world and U.S. energy demand is going to continue growing. We are going to see strong growth, even at slower growth rates, over the next 20 years. We are also going to be tilting dramatically toward cleaner fuels, with the growth rates for natural gas and renewables being about twice the growth rates for oil and coal. Domestic and world energy markets are providing new opportunities, particularly for companies that are equipped to be competitive and which are providing the new energy infrastructure that emerging countries so desperately need. Finally, we are seeing revolutionary change in the natural gas and electricity industries, particularly at the retail level. We think this will lead to lower cost and lower prices. And, probably of equal importance, it will lead to much more innovation—just as we have seen in other industries—and much more creativity, and enormous opportunities for competitive—and I might add, innovative—companies. Thank you.



The Forward March of Natural Gas

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Natural Gas Conference
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Introduction

- Review the World and U.S. Energy Outlook over the Next 20 years
- Discuss the Upcoming Revolution in Customer Choice and the Convergence of Gas and Electricity
- Examine the Role for Renewable Energy in the World's Energy Future

Global and U.S. Energy Outlook

World Energy Demand Outlook
(Quad Btu's)

	1996	2015	Quads Change	%/Yr Change
Oil	140	208	68	2.1%
Natural Gas	77	147	70	3.4%
Coal	90	131	41	2.0%
Nuclear	22	21	-1	-0.1%
Renewables*	29	57	28	3.6%
Total	358	564	206	2.4%
Secondary Energy Demand				
Electricity	136	261	125	3.5%

*Includes Hydro
Source: 1997 Enron Outlook (Preliminary)

World Natural Gas Demand Outlook by Region

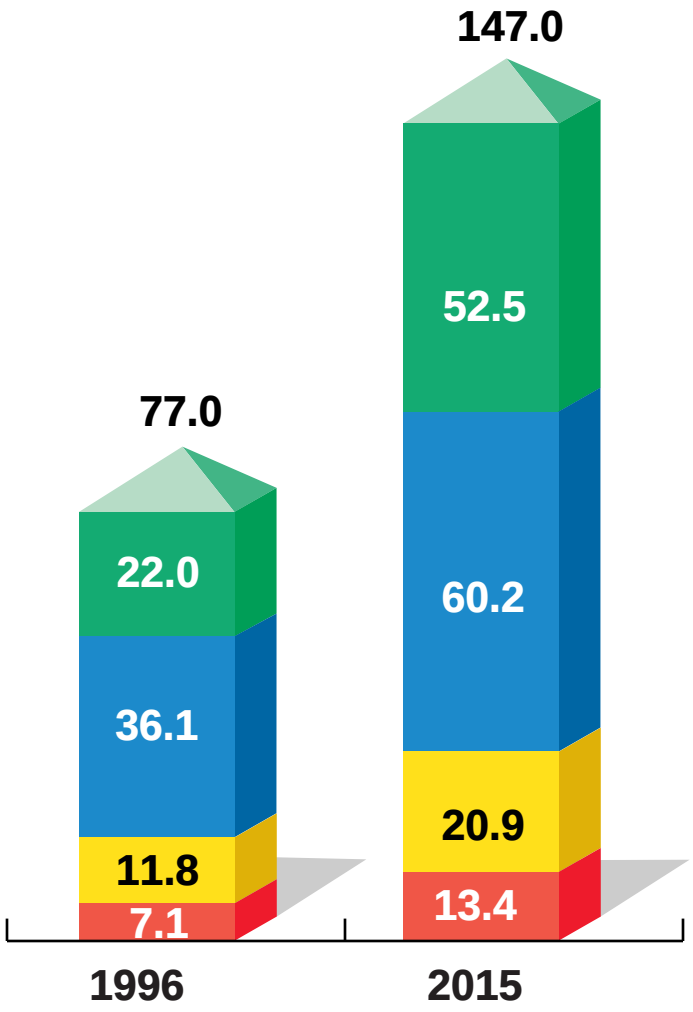
1996 vs. 2015

(in Tcf)

Area	1996	2015	Quads Change	%/Yr Change
Latin America	3.0	11.1	8.1	7.1%
Middle East/Africa	6.0	17.0	11.0	5.6%
Asia/ Pacific Rim	8.0	22.1	14.1	5.5%
Western Europe	12.3	23.0	10.7	3.4%
North America	26.2	42.1	15.9	2.5%
Russia/FSU/E. Europe	22.0	32.0	10.0	2.0%
Total	77.5	147.3	69.8	3.4%

Source: 1997 Enron Outlook

World Natural Gas Demand by Segment
(In Quad Btus)



Volume Growth 1996 vs. 2015	
Power Plants	30.5
Industrial	24.1
Residential/ Commercial	9.1
Other (1)	6.3
Total	70.0

Source: 1997 Enron Outlook

(1) Includes E&P and government use, gas plants, and pipelines

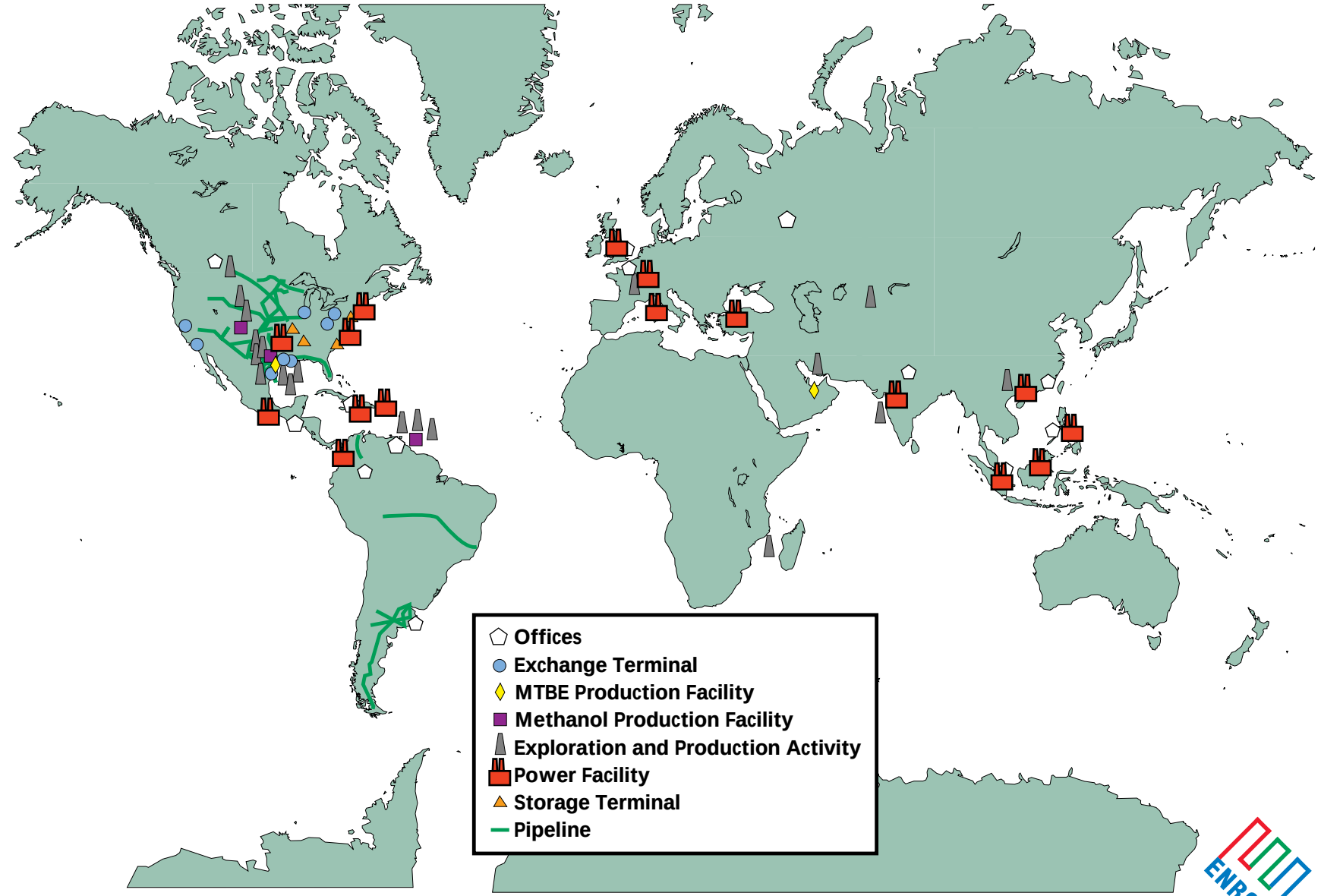
World Natural Gas Demand Forecast

(Tcf)

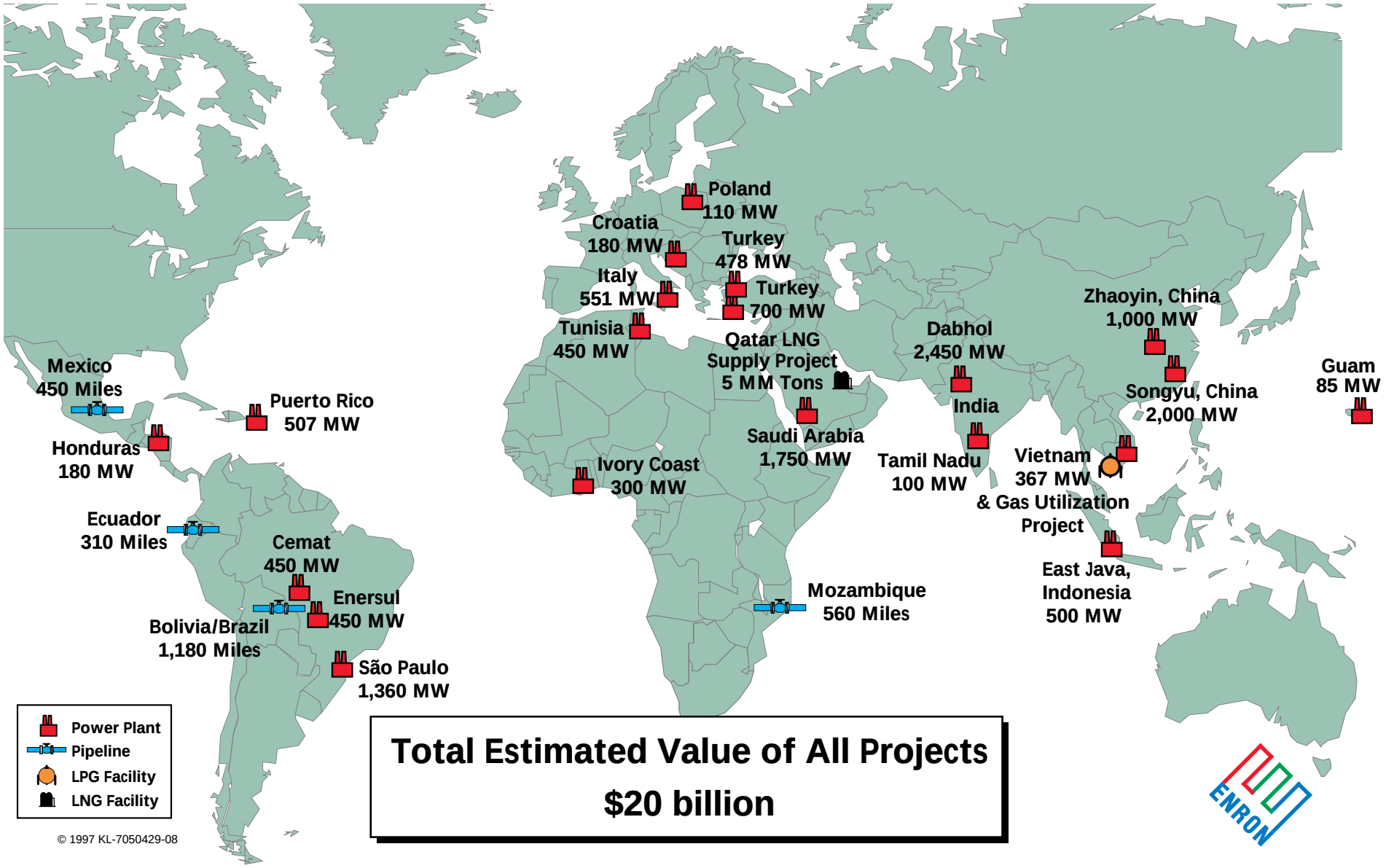
Area	1996	2015	Increase	%/Yr Change
North America	26	42	16	2.6%
Russia/FSU/Eastern Europe	22	32	10	2.0%
Asia/Pacific Rim	8	22	14	5.5%
Western Europe	12	23	11	3.5%
Middle East	4	12	8	6.0%
Latin America	3	11	8	7.1%
Africa	2	5	3	4.9%
Total	77	147	70	3.5%

Source: 1997 Enron Outlook

Enron Global Presence & Project Experience



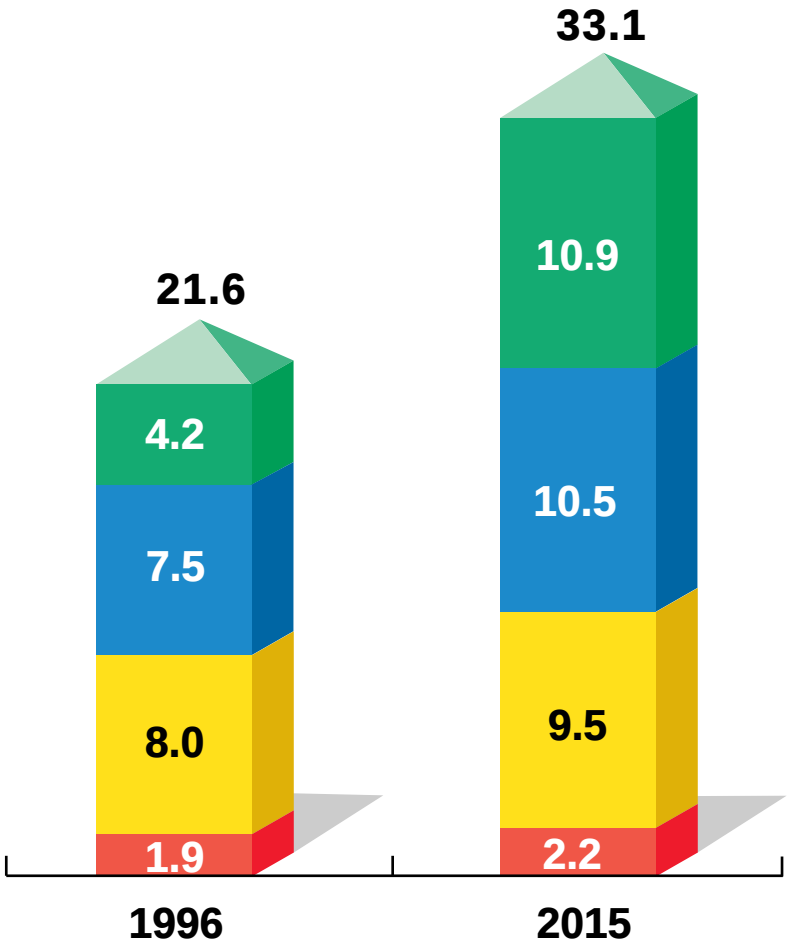
Projects Under Active Development



Total Estimated Value of All Projects

$20 billion

U.S. Gas Demand by Segment
(In Quad Btus)



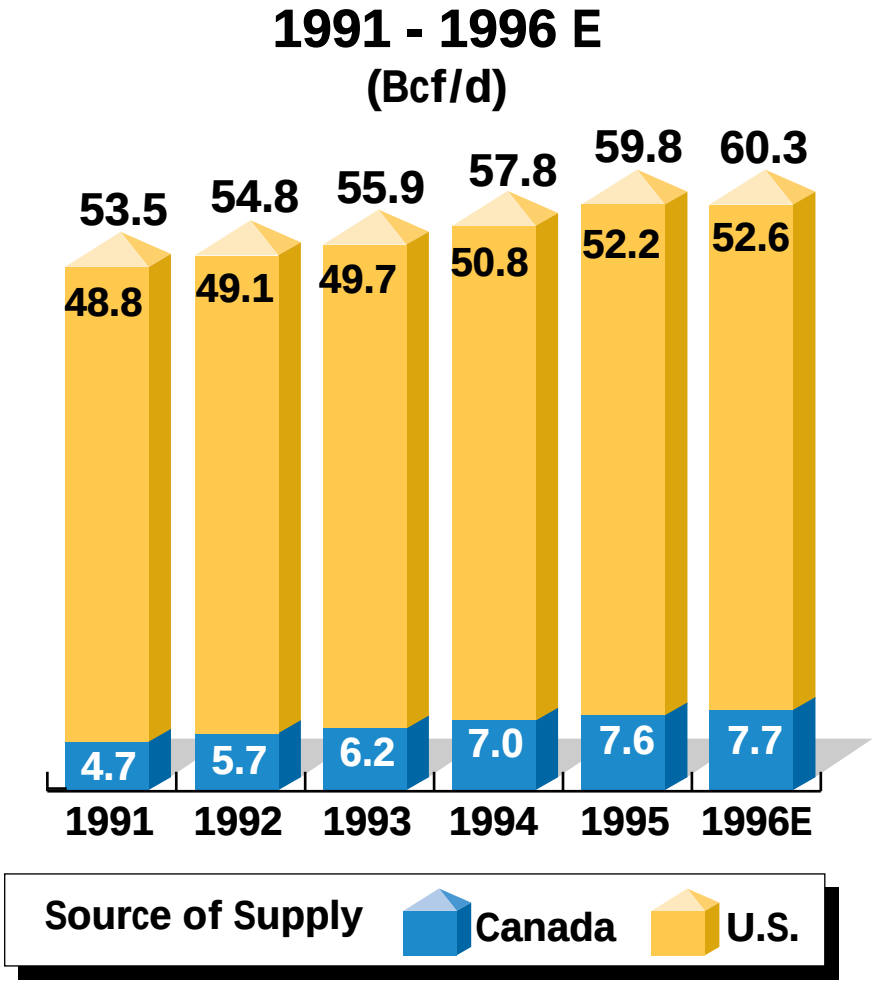
Volume Growth
1996 vs. 2015

Power Plants	6.7
Industrial	3.0
Residential/ Commercial	1.5
Other (1)	0.3
Total	11.5

Source: 1997 Enron Outlook

(1) Includes E&P and government use, gas plants, and pipelines

U.S. Natural Gas Supply and Demand



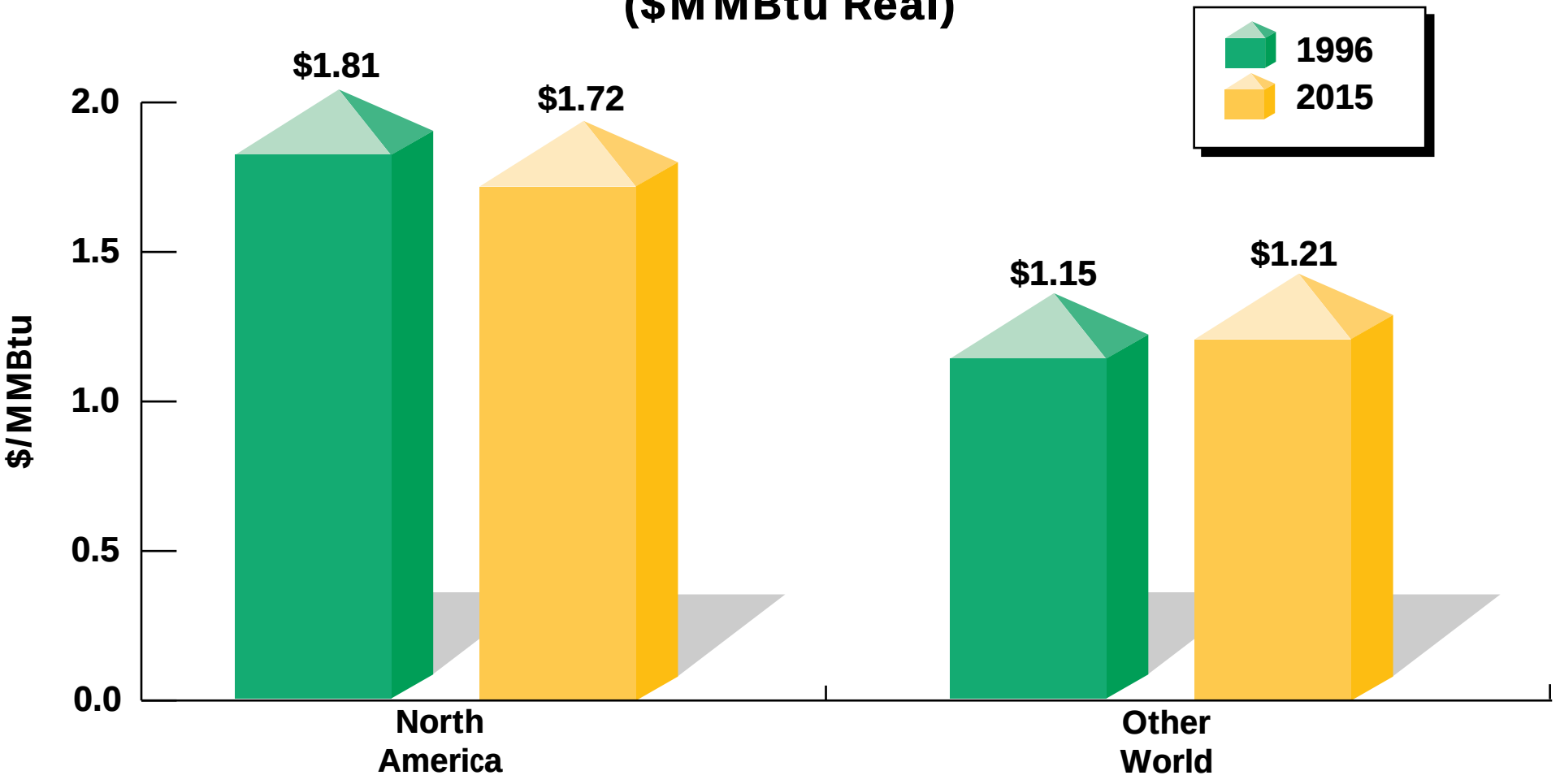
Source: Energy Information Administration

	(Bcf/d) 1991-96	1997-98
Average Annual Demand Increase	1.4	?
Supply Sources:		
U.S.	0.8*	0.3-0.8
Canada	0.6	0.1-0.2
Total	1.4	0.4-1.0

* We estimate that 50% of this increase came from supply increases and 50% from efficiency increases.

World Natural Gas Average Netback Prices

($MMBtu Real)

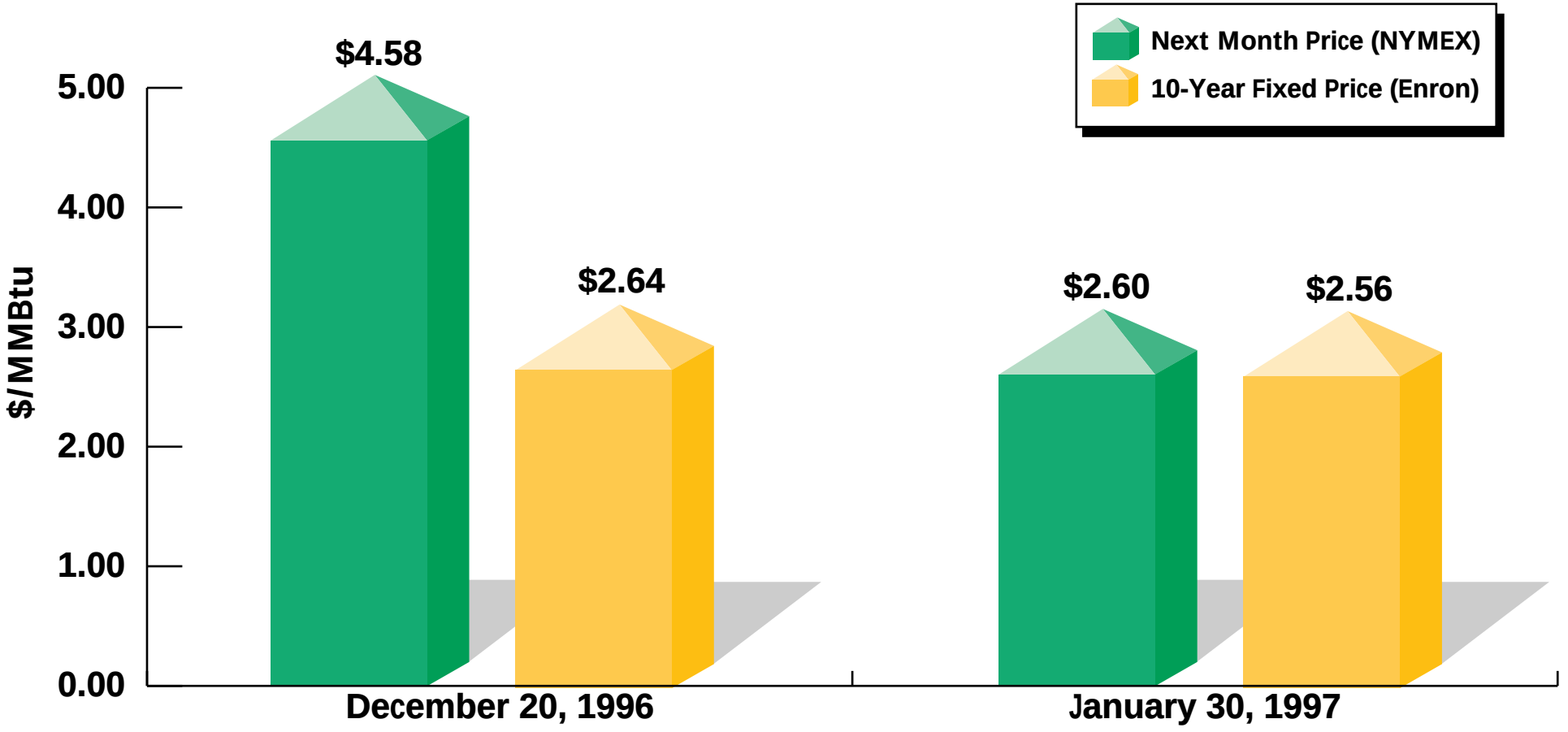


Source: 1997 Enron Outlook

Average World Price Is Relatively Unchanged Over the Next 20 Years in Real Terms

Natural Gas Price Fluctuations

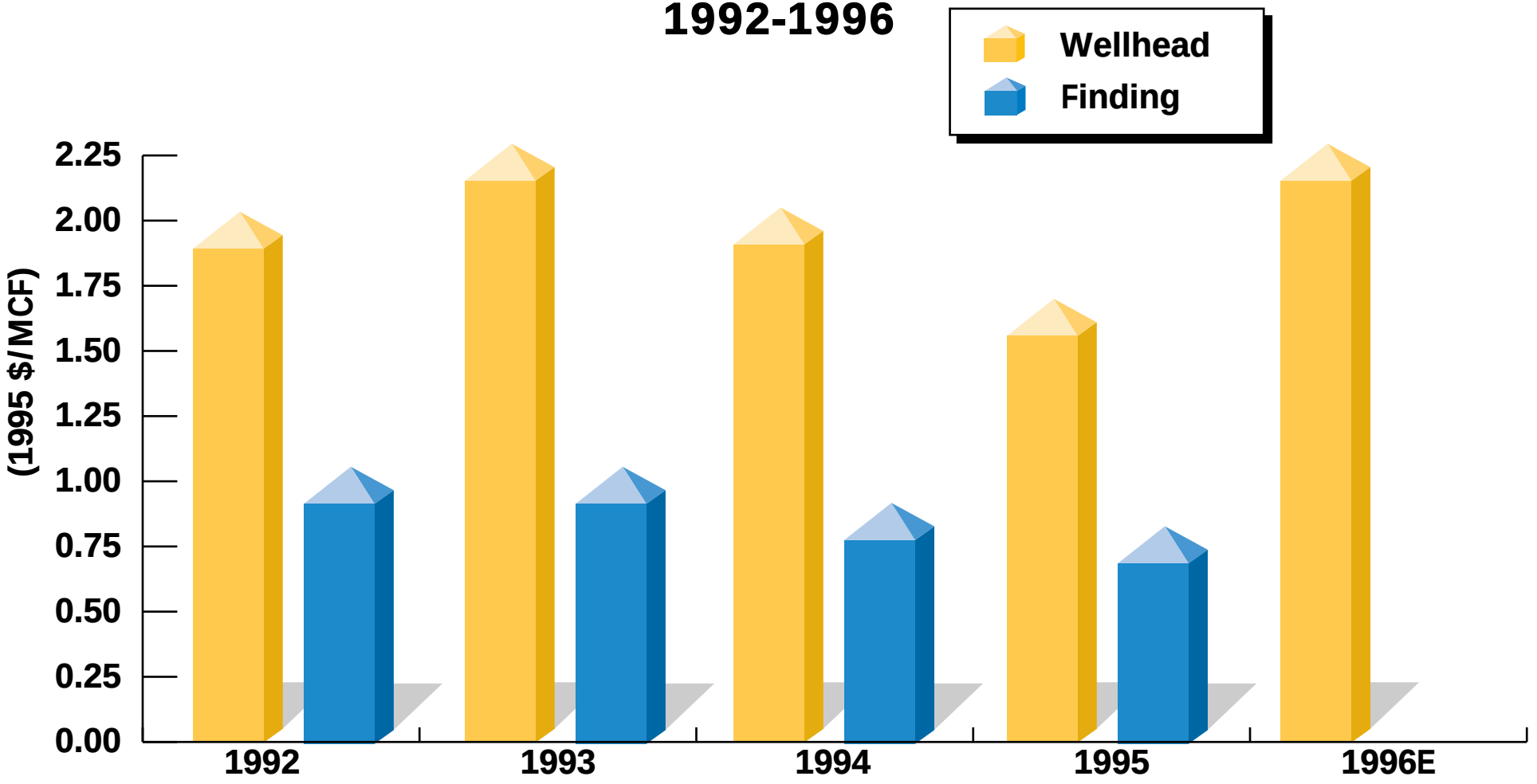
Short Term vs. Long Term



Source: Enron Capital & Trade Resources

U.S. Wellhead Gas Prices and Finding Costs

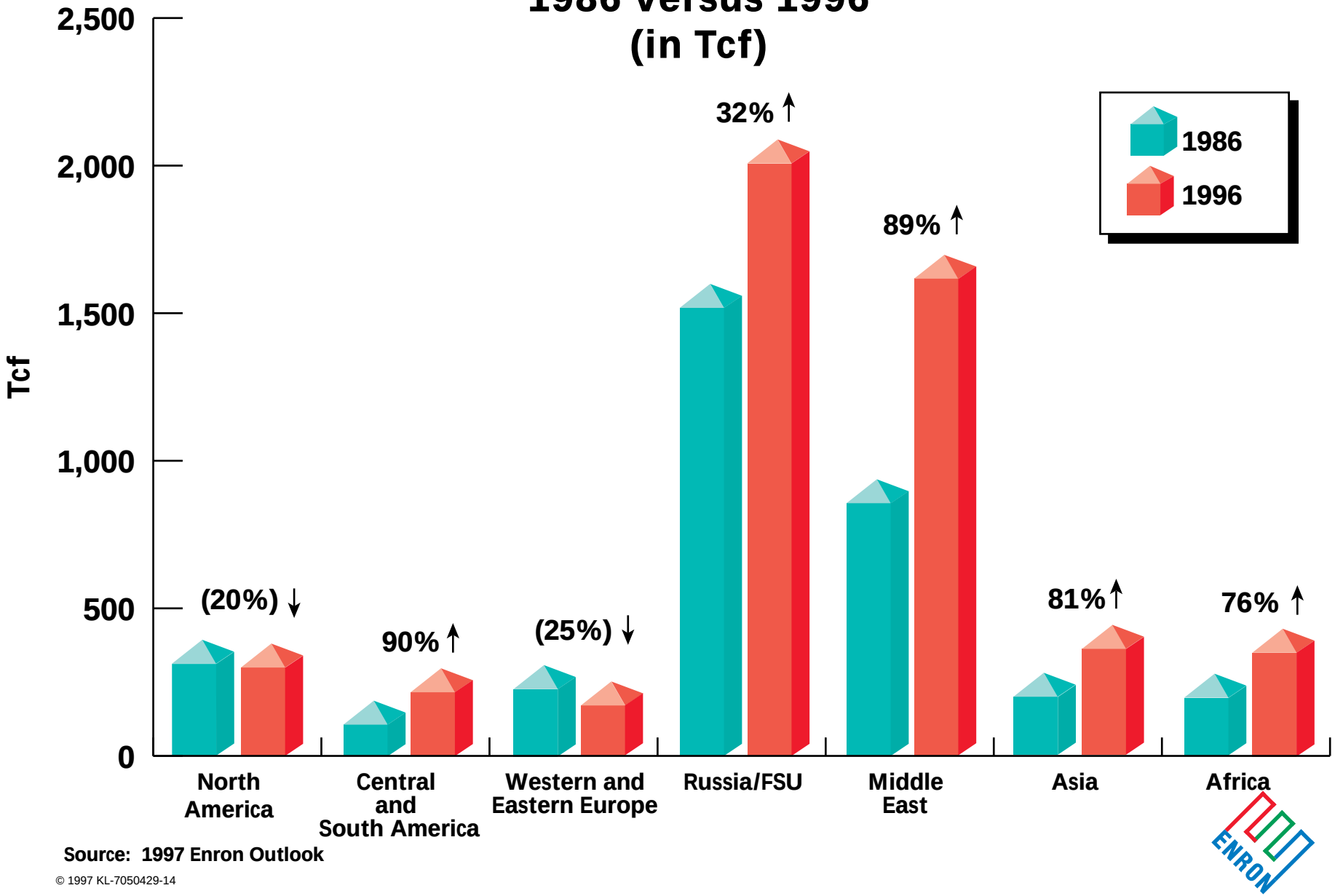
1992-1996



Source: Energy Information Administration

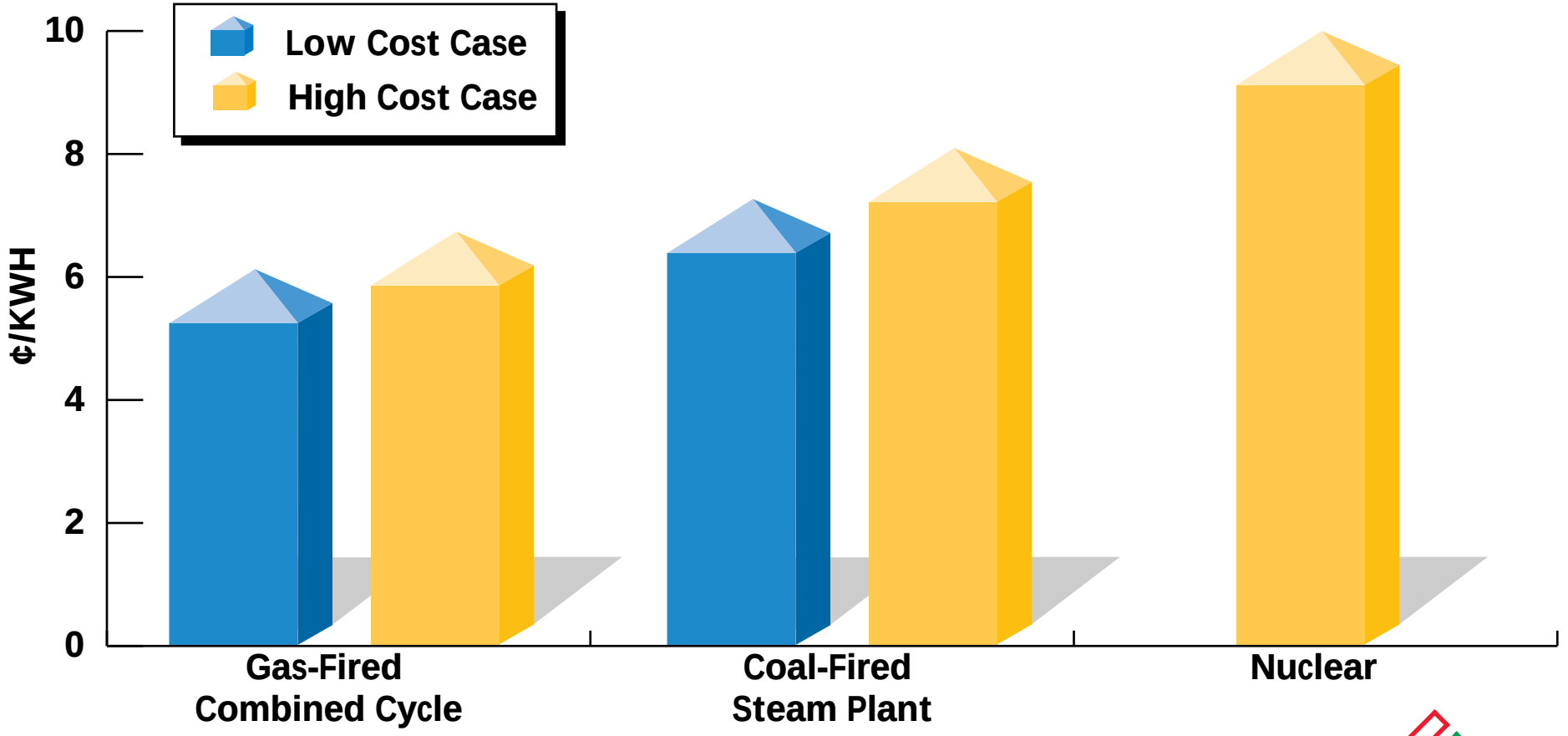
World Natural Gas Proven Reserves

1986 versus 1996
(in Tcf)



Source: 1997 Enron Outlook

Electric Generation Levelized Cost
Comparison Under Current Technology
(¢/KWH)

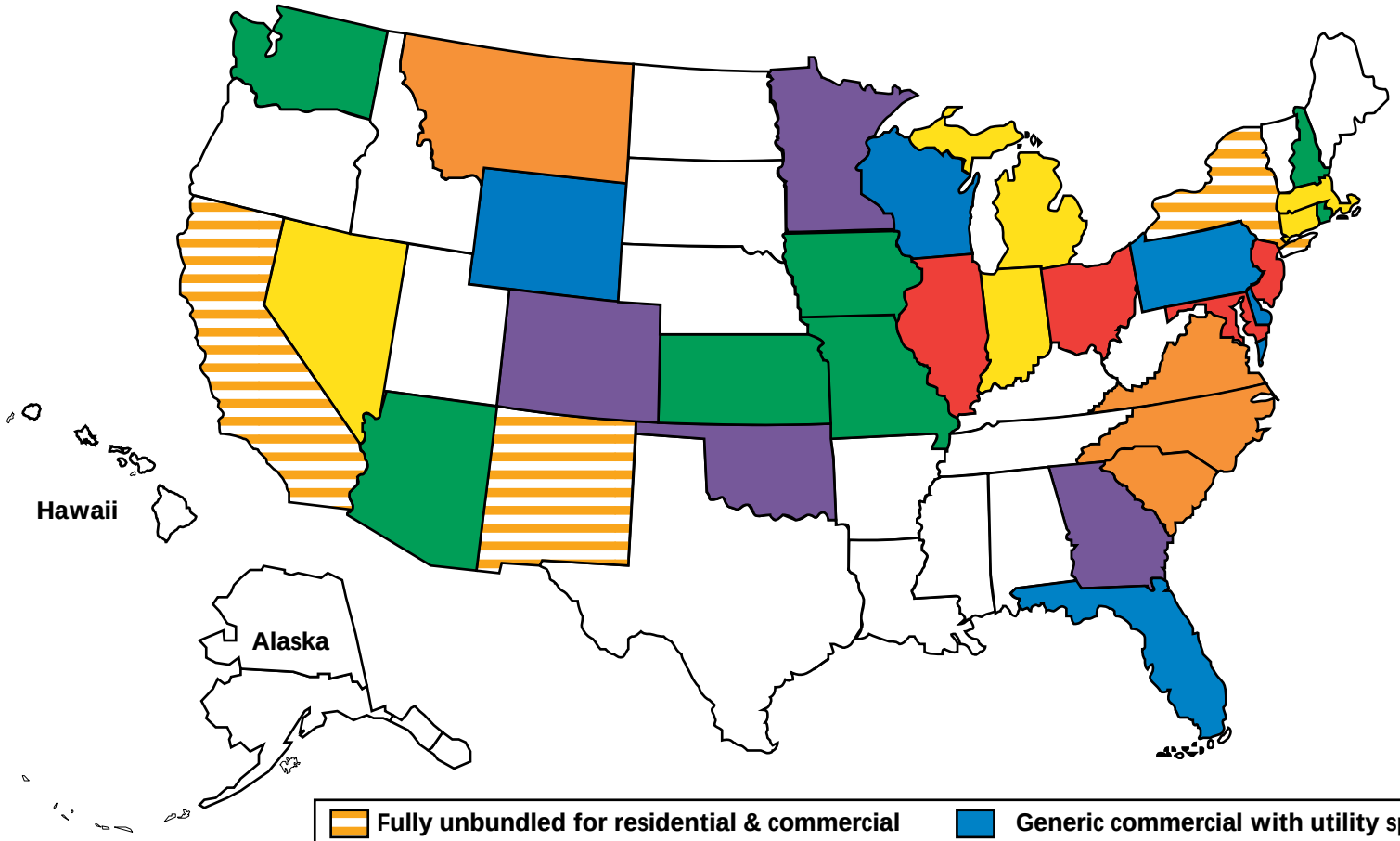


Source: 1997 Enron Outlook

Customer Choice

The Next Energy Revolution

Natural Gas Restructuring Update



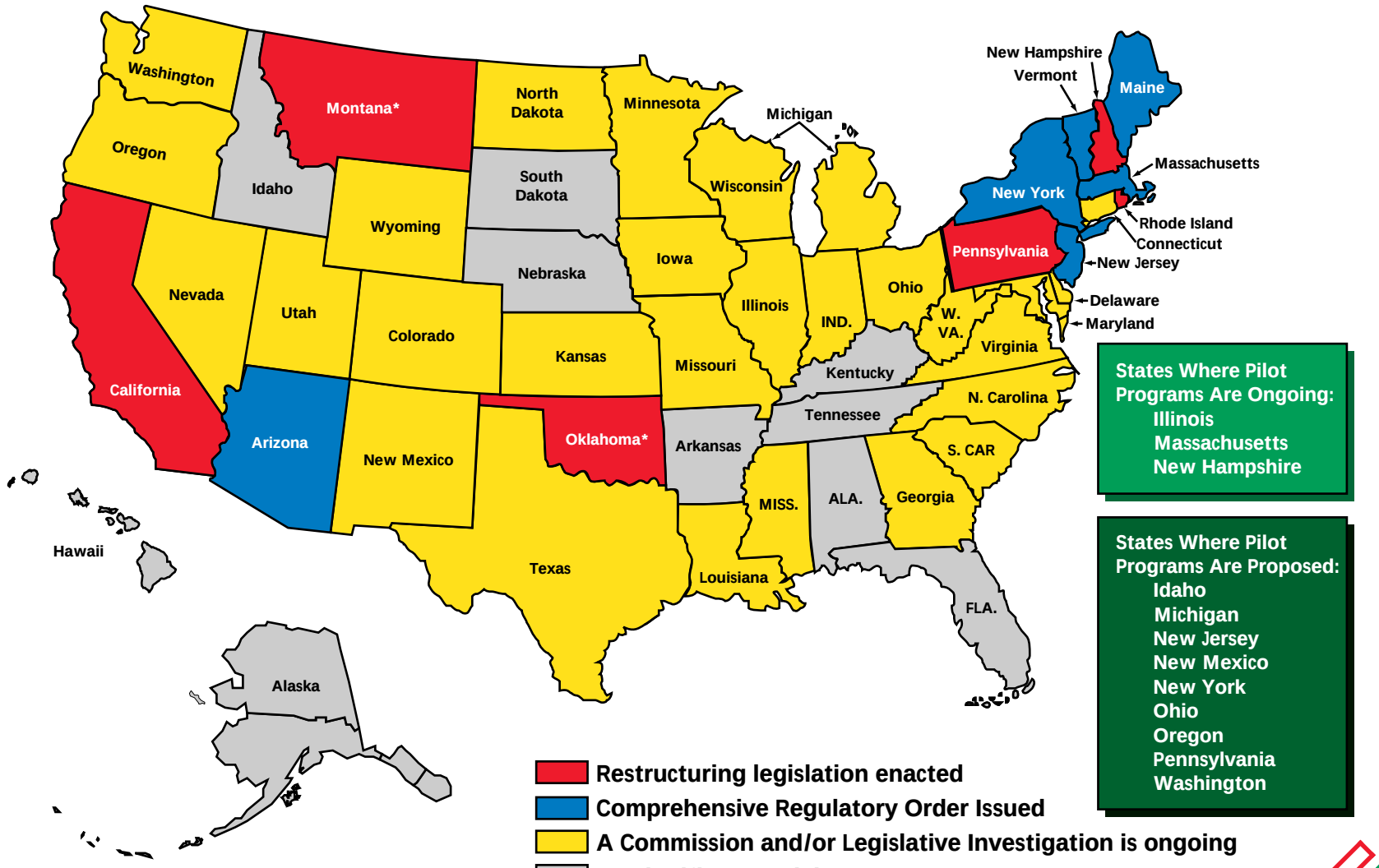
States With Residential Pilot Programs:

- California
- Iowa
- Wisconsin
- Ohio
- Pennsylvania
- New York
- New Jersey
- Maryland

- Fully unbundled for residential & commercial
- Fully unbundled for commercial
- Generic commercial investigations ongoing
- Generic commercial with specific cases ongoing
- Generic commercial with utility specific cases approved
- Utility commercial specific cases ongoing
- Utility commercial specific cases approved
- No significant activity

Source: Regulatory Affairs as of 4/4/97
Note: Industrial open nationwide

Electric Industry Restructuring - Current



States Where Pilot Programs Are Ongoing:

- Illinois
- Massachusetts
- New Hampshire

States Where Pilot Programs Are Proposed:

- Idaho
- Michigan
- New Jersey
- New Mexico
- New York
- Ohio
- Oregon
- Pennsylvania
- Washington

Restructuring legislation enacted

Comprehensive Regulatory Order Issued

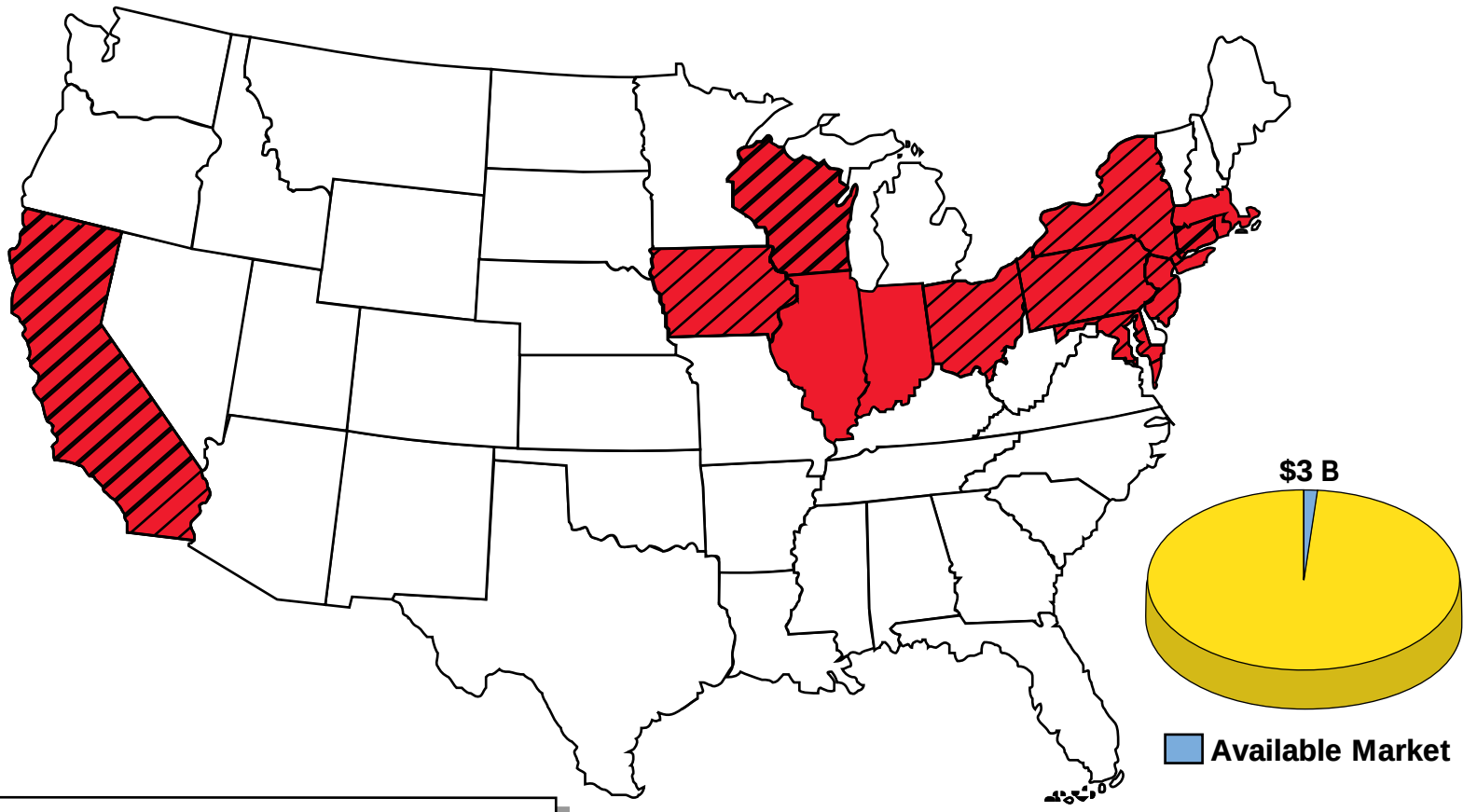
A Commission and/or Legislative Investigation is ongoing

No significant Activity

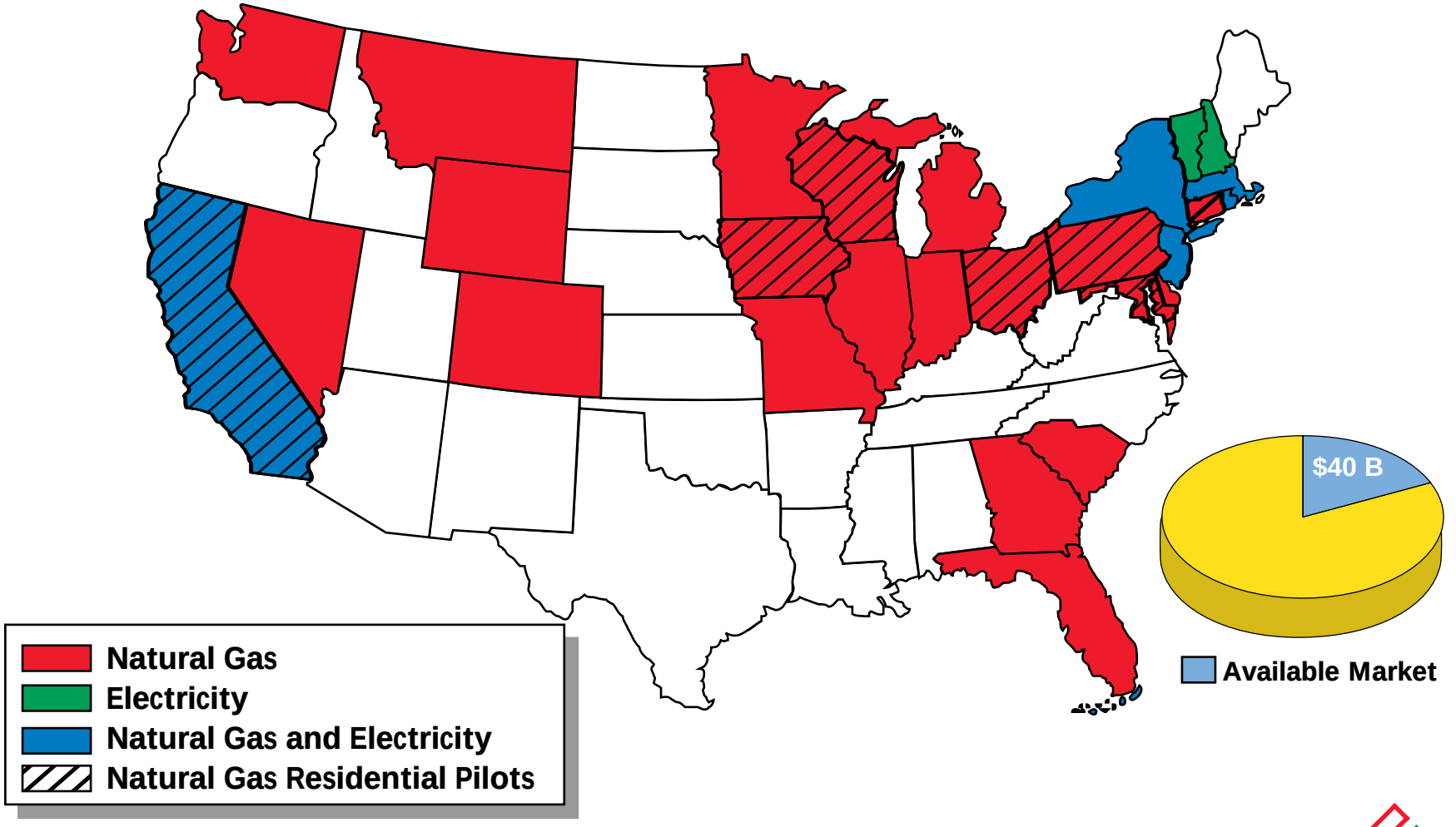
* Not yet signed by Governor

ENRON

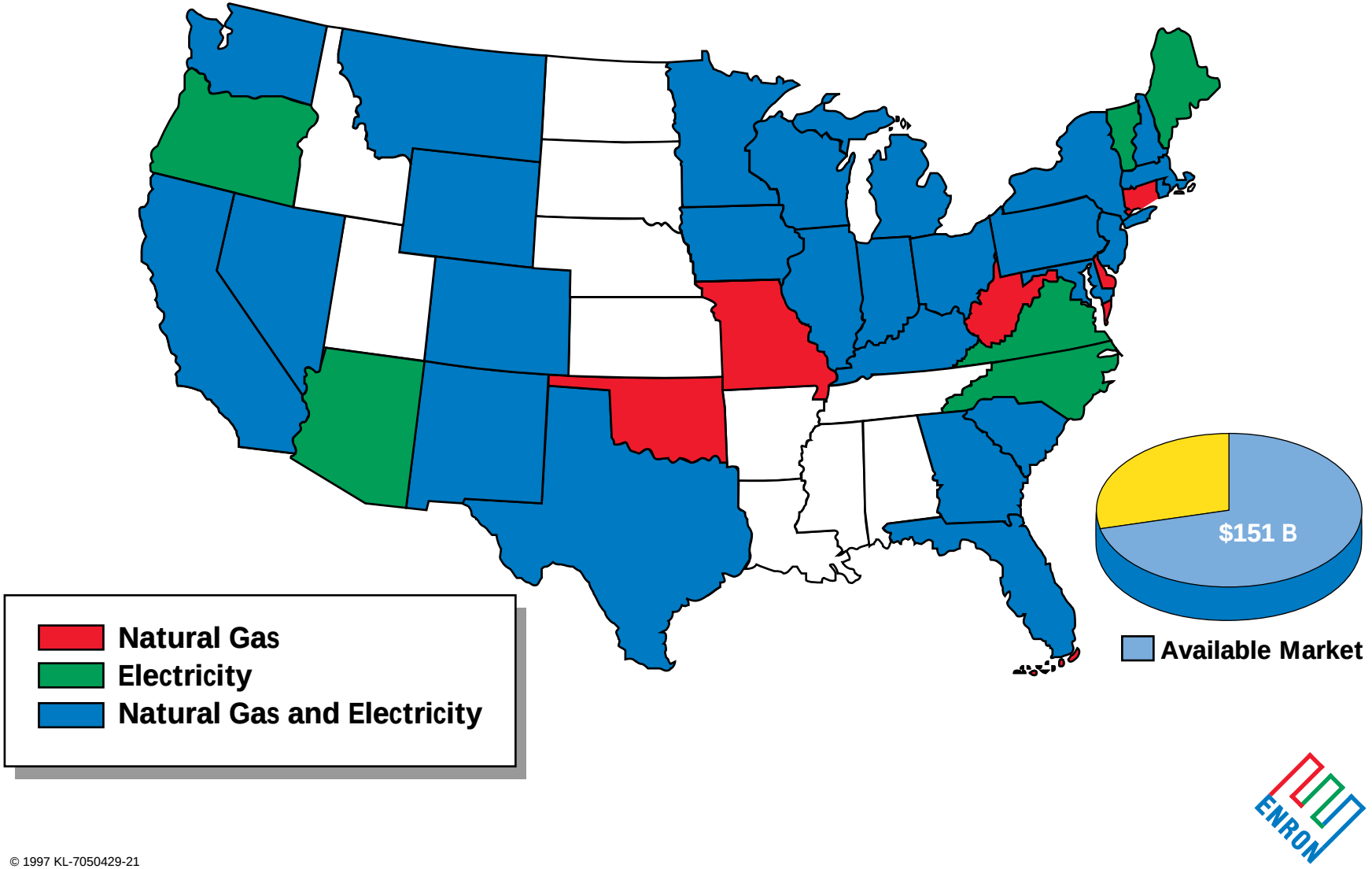
The Retail Market in 1997



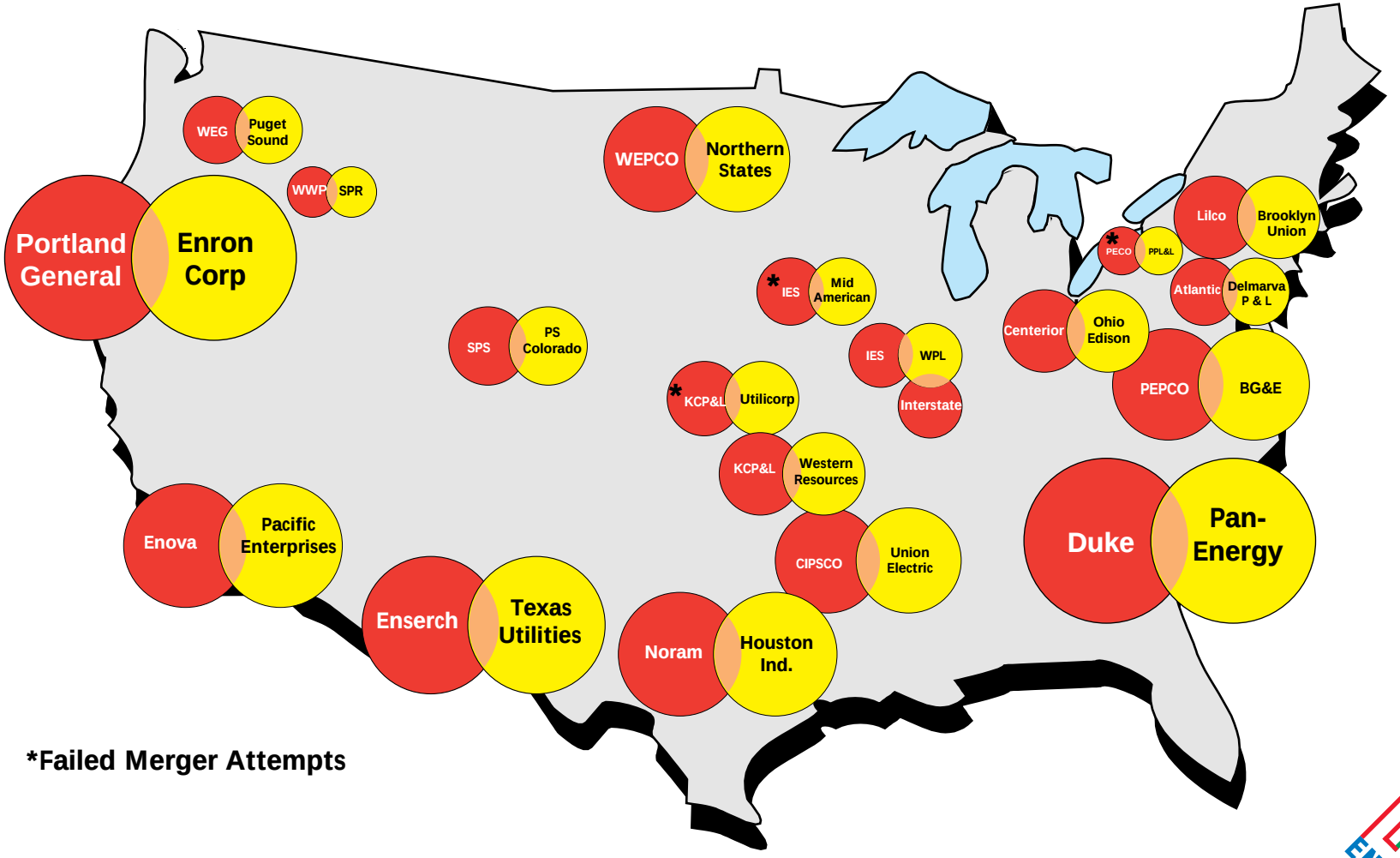
The Retail Market in 1998



The Retail Market in 2001

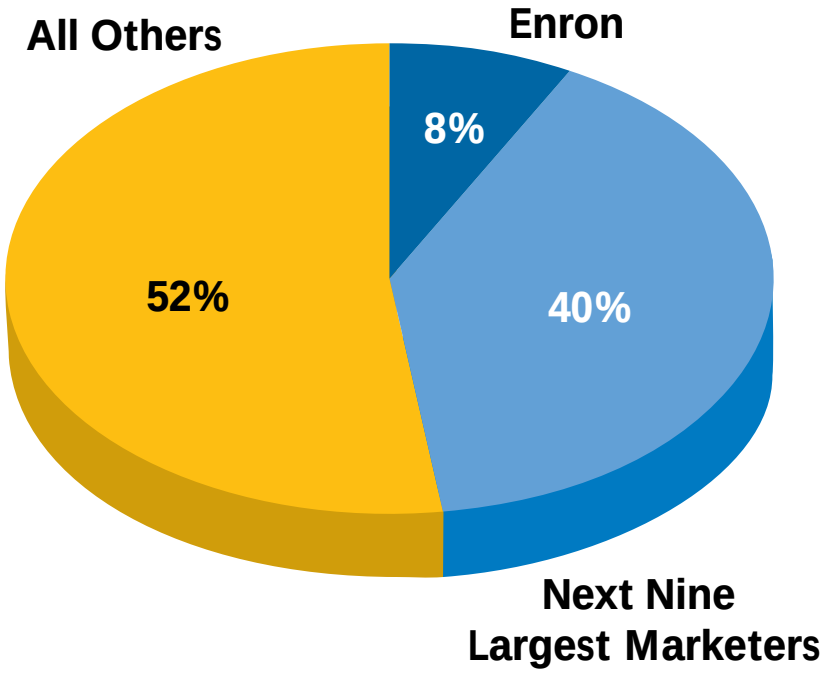


Announced U.S. Utility Mergers: 1994-'96

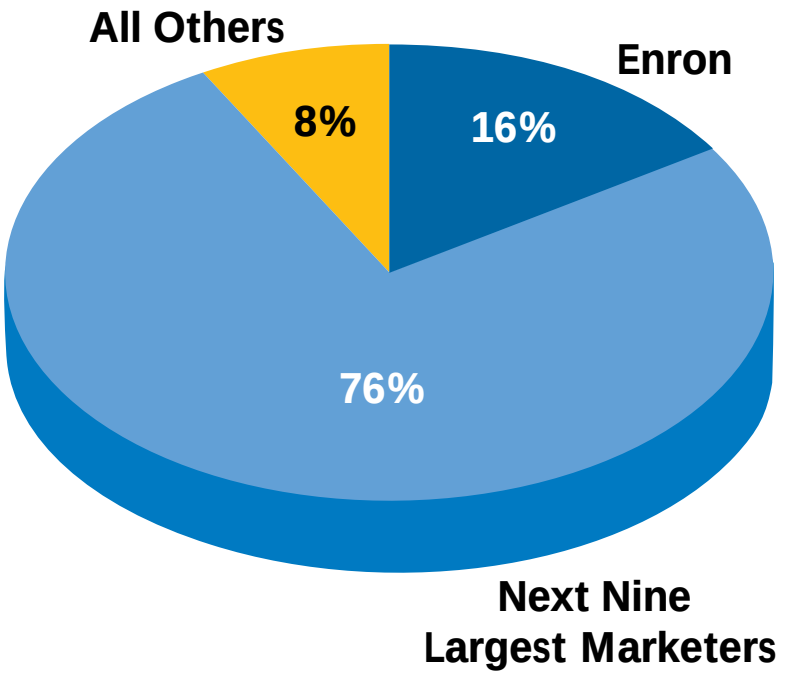


*Failed Merger Attempts

North American Natural Gas Merchants
(Market Share)



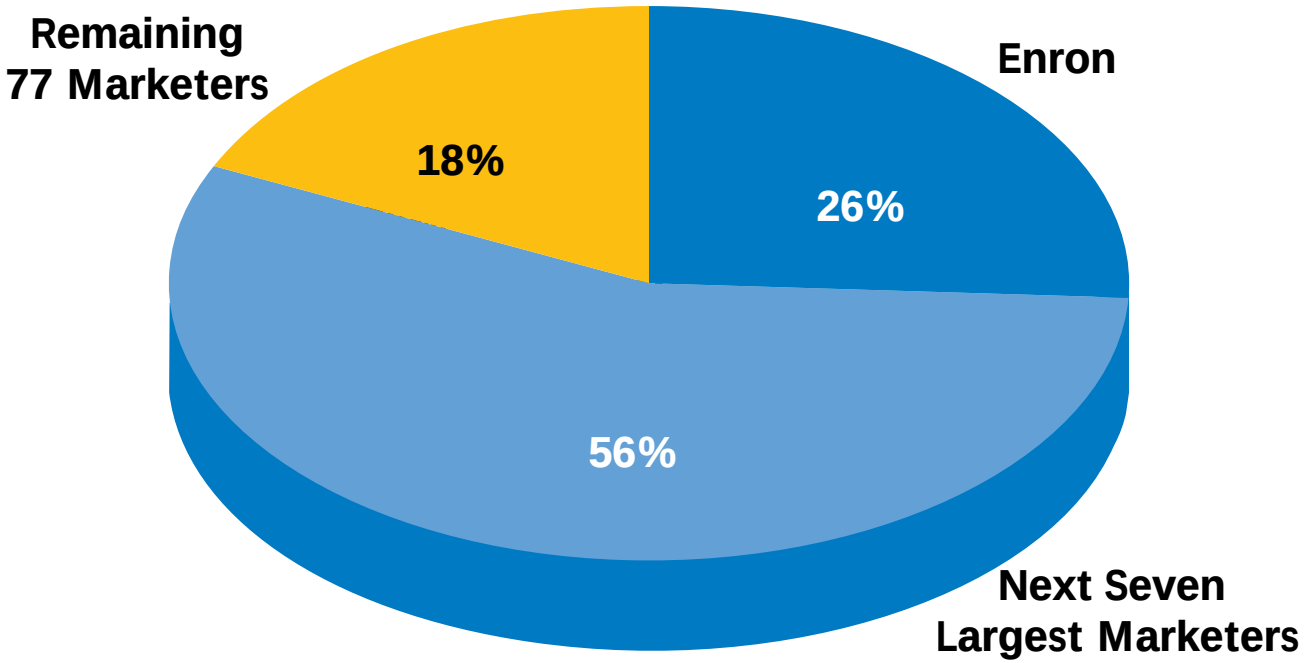
1990



1996E

Source: F.E.R.C.

Share of Non-Regulated Electricity Wholesale Market: 1996



Source: F.E.R.C.

America's Most Admired Companies

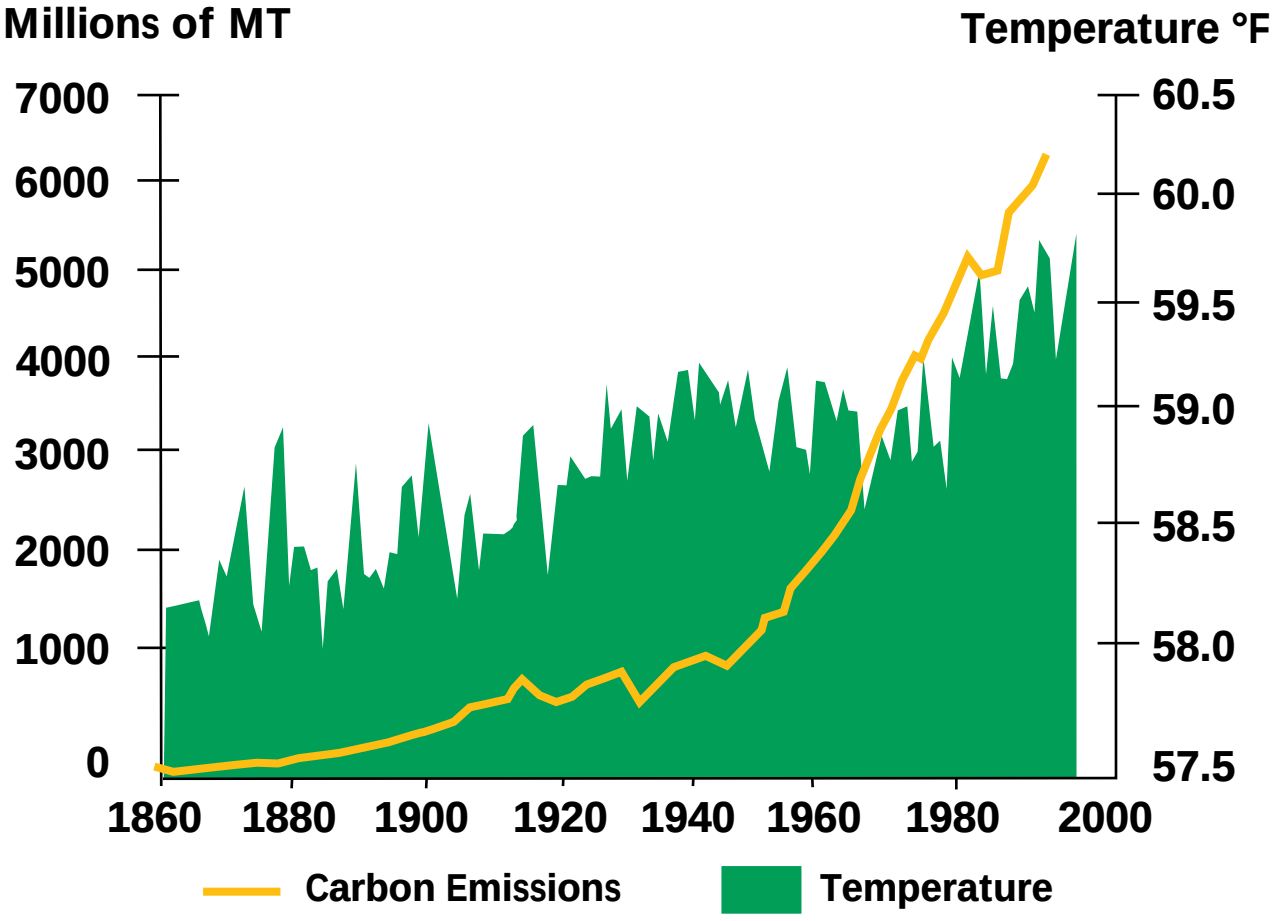
Innovativeness

No. 1 for Second Consecutive Year

Rank	Company	Score
1	Enron	9.01
2	Mirage Resorts	8.90
3	Intel	8.87

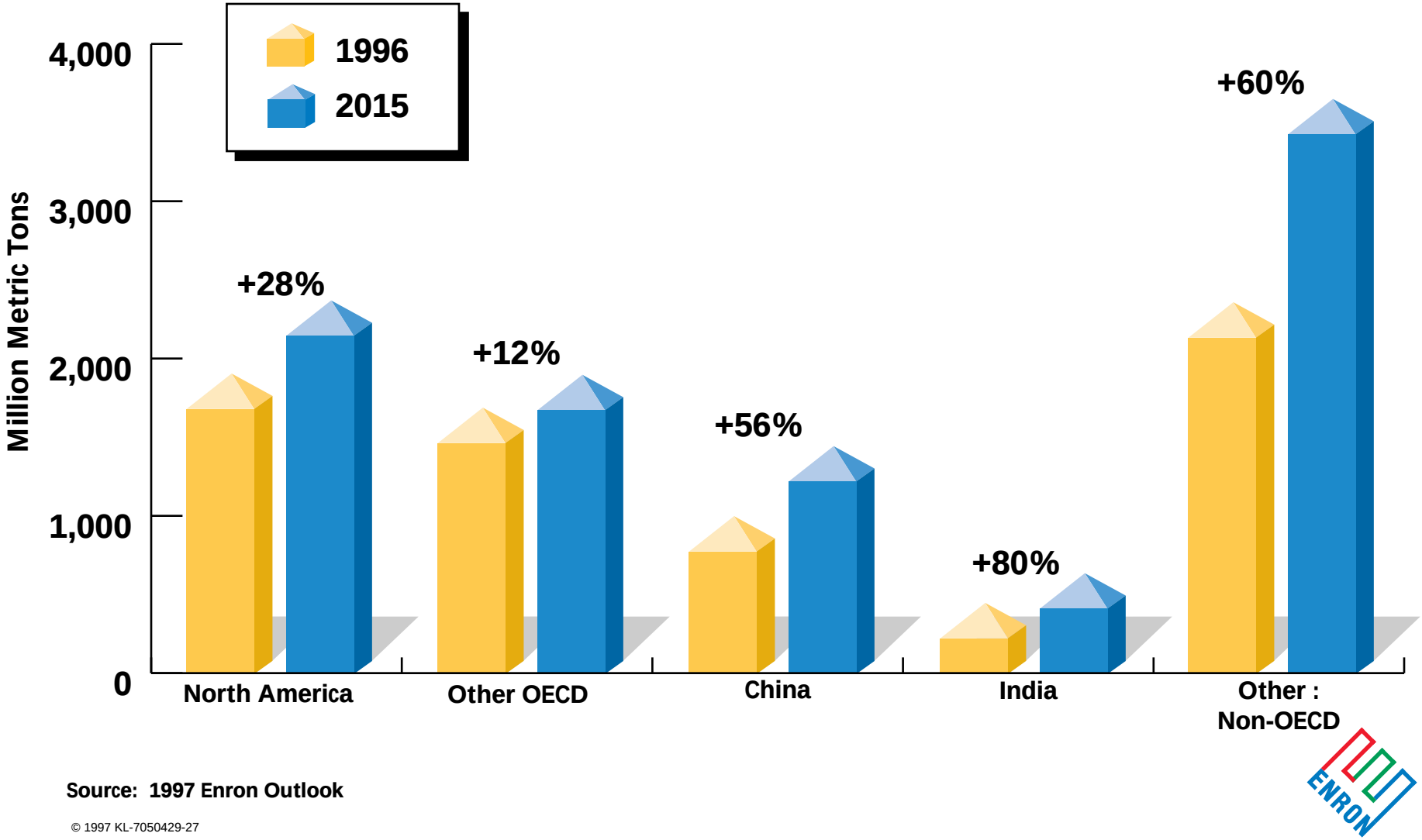
Source: Fortune, March 3, 1997

The Greenhouse Effect



162 Nations Have Committed in the Rio Treaty to Help Stabilize World CO_2 Emissions... But the Emissions Continue to Increase

Carbon Dioxide Emissions By Region
1996 vs. 2015

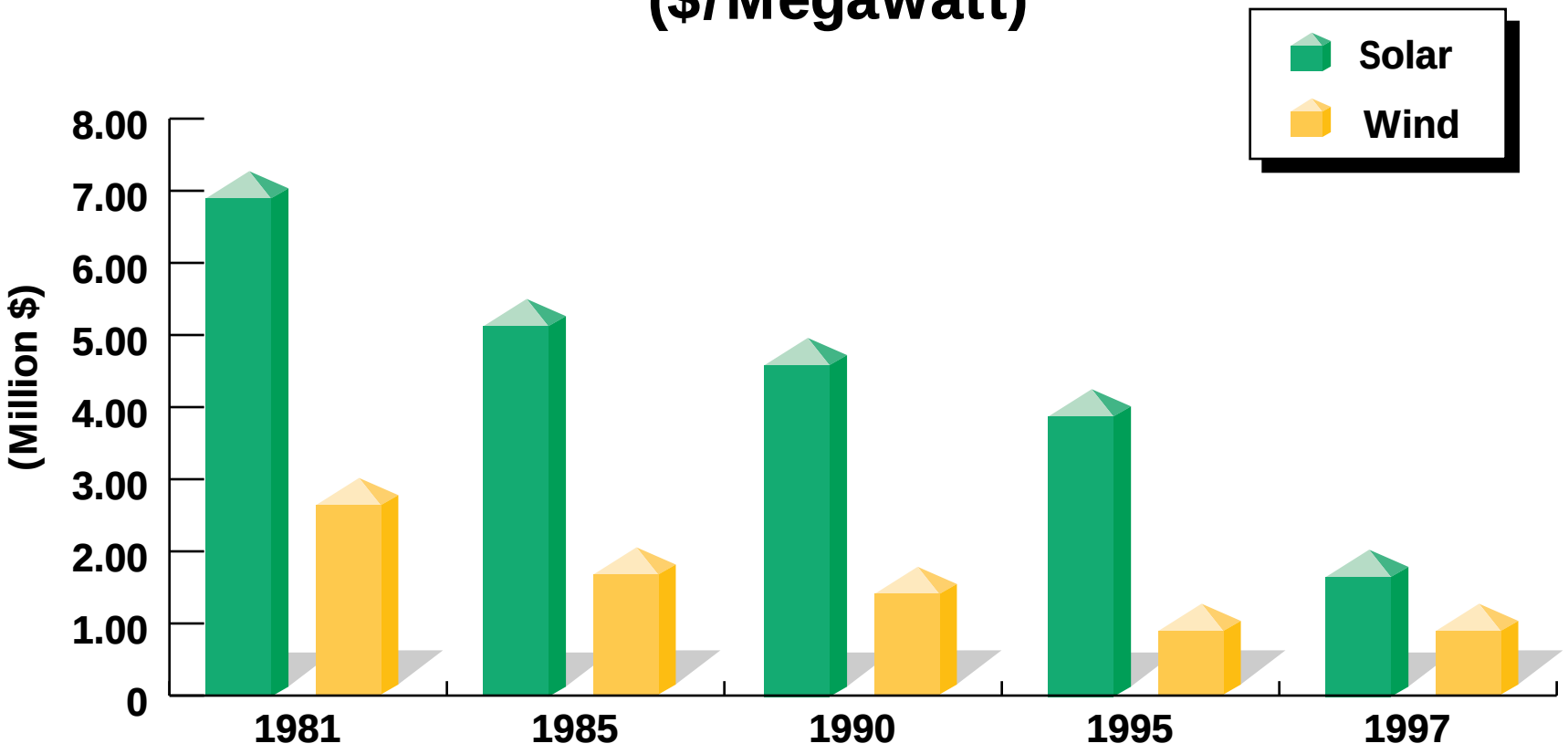


Source: 1997 Enron Outlook

Enron Renewable Energy Corp.

- **Wind, Solar and Hydro Capacity Necessary to Complement Natural Gas as the World Moves toward Clean Energy**
- **Enron will be a World Leader in Renewable Energy as in Natural Gas**
  - **Amoco/Enron Solar**
  - **Zond Corporation**
- **International Hydro Projects are the only Alternative to Fossil Fuels in Large MW Applications**

Improvements in Technology
($/Megawatt)

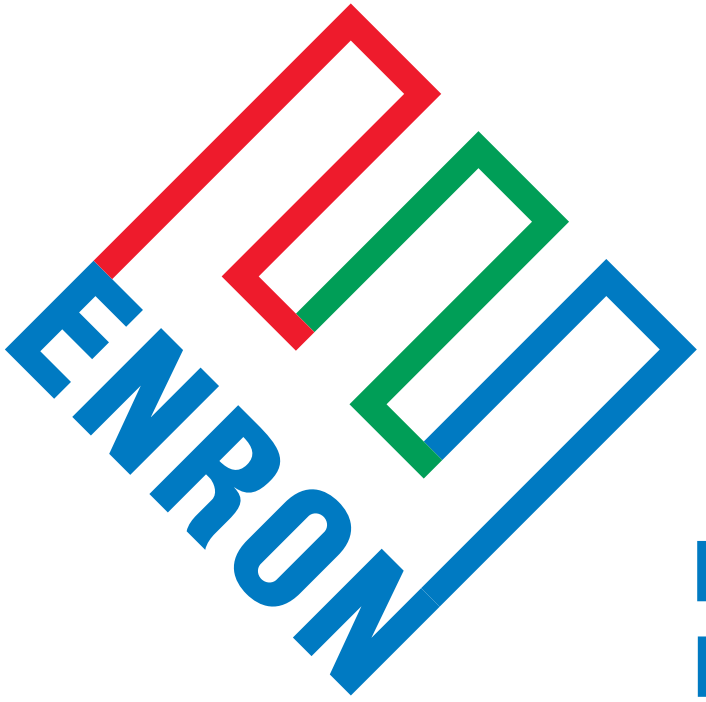


Technology Improvements Are Significantly Lowering the Cost of Renewable Energy

Source: Enron Renewable Company

Conclusions

- **World and U.S. Energy Demand is Tilting Toward Clean Fuels Such as Natural Gas and Renewables**
- **Domestic and World Energy Markets Are Providing Great New Opportunities For Many Large U.S.-Based Natural Gas Companies**
- **“Revolutionary Change” is Accelerating as More Economies Liberalize to Meet Energy Infrastructure Needs and Customer Choice is Introduced in Natural Gas and Electricity**



Natural gas. Electricity.
Endless possibilities.™